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The B.N.E. C.90 ELECTRIC COOKER with the SPEEDHEAT OVEN

400° in 12 minutes with a loading of 2,500 watts. That's the startling performance of the new "Speedheat" oven—saving time and money. Add smart appearance, modern lines, special easy-to-clean features and sound construction, and you have the B.N.E. C.90 luxury cooker. Make sure there is one in *Your* showroom.

Large oven has drop-down door with easy grip handle.

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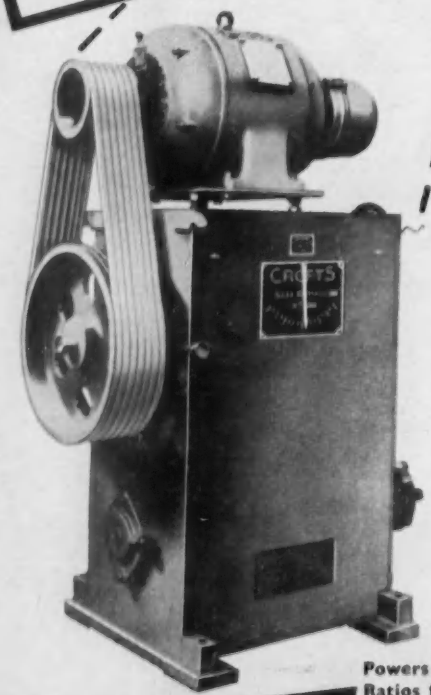

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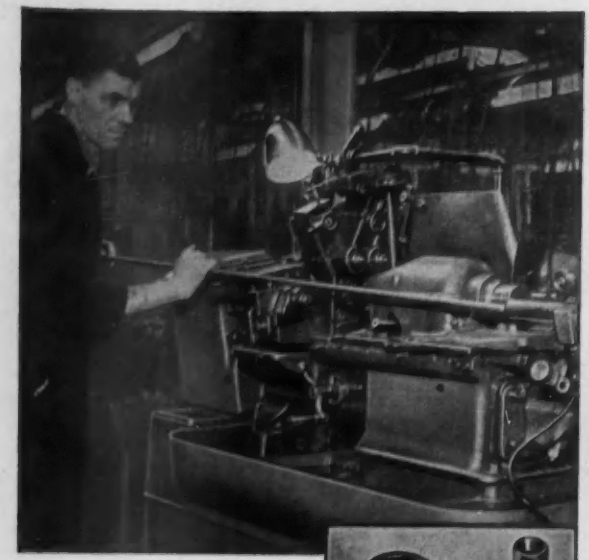

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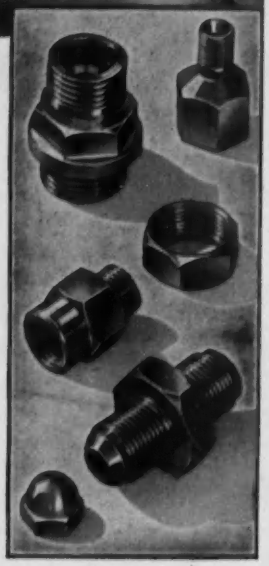

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Announcing the NEW Season's Range of

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Electric FIRES

PRICES EFFECTIVE FROM AUGUST 24th, 1955

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All are fitted with special guards to B.S. specification and conform to latest safety requirements.

Guards and reflectors where applicable, are chromium plated.

When ordering please state catalogue number, colour and voltage required.

'OUTSET' FOR DIRECT WALL MOUNTING

Pastel Finishes—GREY, GREEN, BEIGE with 'Solaray' (pencil type) or 'Challenge' (block type) fire bars.

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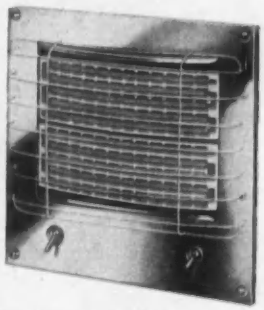

'INSET' FOR FLUSH MOUNTING with slabbing frame for Tiled surrounds.

Pastel Finishes:-GREY, GREEN, BEIGE with 'Solaray' (pencil type) or 'Challenge' (block type) fire bars.

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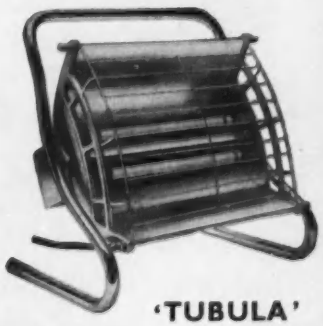
If supplied with enclosed sheet metal box in place of slabbing frame—1 k.w. size **2/3** extra + P.T. **10d.** 2 k.w. size **3/4** extra + P.T. **1/4** (State on order).

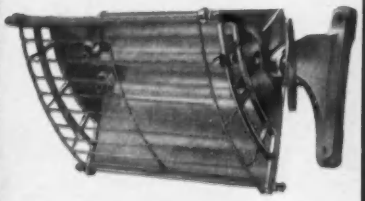


'TUBULA'

This attractive portable fire has a chromium plated tubular frame with wide range adjustable reflector, and "Solaray" (pencil type) fire bars.

F.14542 1 k.w. Solaray **67/6** + **24/8** P.T.
F.14544 2 k.w. „ **90/-** + **32/11** P.T.

Complete with 6ft. of flexible cable.



'REFLEXAM'

This wall mounting fire is ideal for bathrooms, nurseries, etc. where it can be placed out of reach, the adjustable reflector and switch being provided with an attachment for a hanging cord.

Finished in art shade Silver with chromium reflector and "Solaray" (pencil type) fire bars.

F.14546 1 k.w. Solaray **70/6** + **25/10** P.T.
F.14548 2 k.w. „ **95/6** + **35/-** P.T.

'DOLPHIN'

Stability is the keynote of this distinctive portable model of cast iron construction finished in Beige vitreous enamel with 'Challenge' (block type) fire bars.

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Complete with 6ft. of flexible cable.

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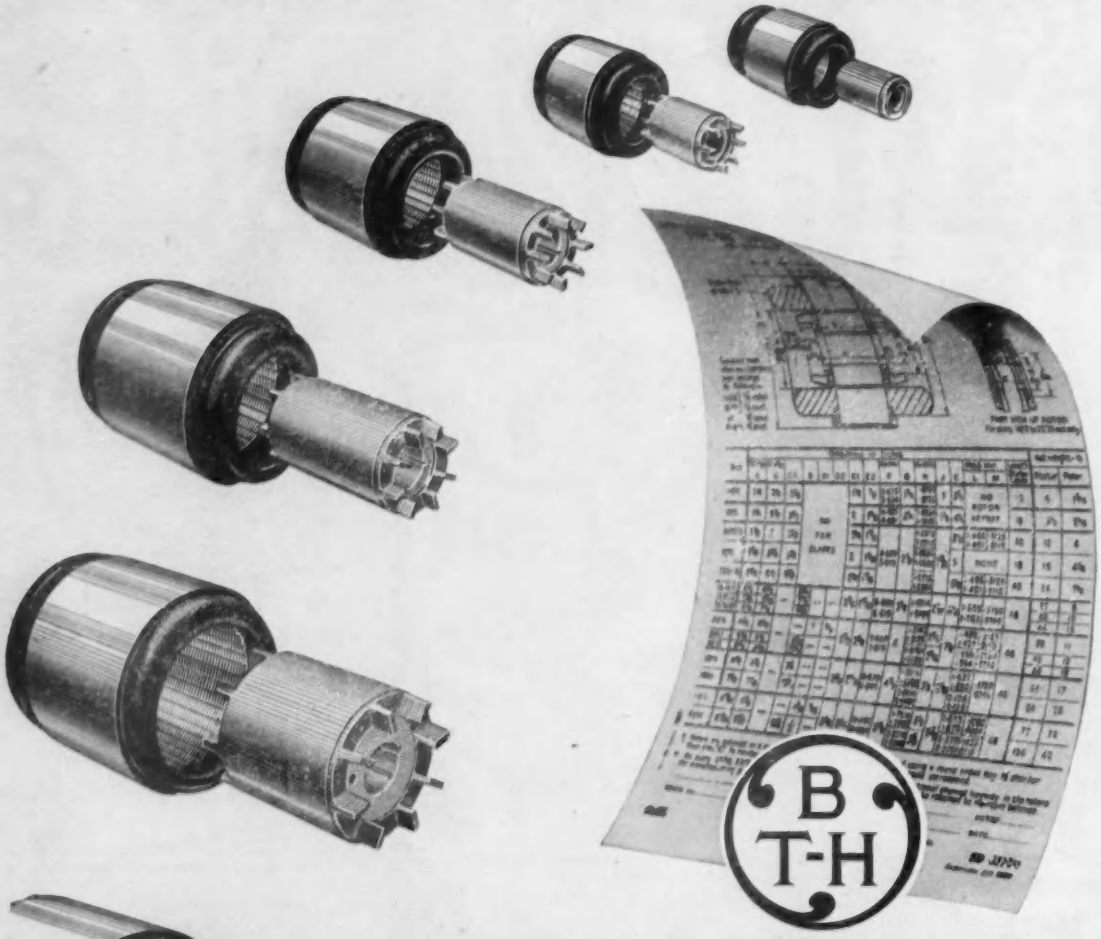
NOTE: NEW PURCHASE TAX, OCTOBER 27, 1955—ALL P.T. RATES SHOWN ABOVE NOW INCREASED BY ONE-FIFTH

BUILD-IN A RELIABLE DRIVE!



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Built-in electrical drives have many advantages—exceedingly compact, no unnecessary belts or shaft couplings, torque available precisely where required. The reliability of BTH A.C. motor units is unquestioned—many thousands are in everyday use, all over the World, driving machine-tools and other mechanisms.

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A 4539

A new Fused Connector-Box
with earthing facilities

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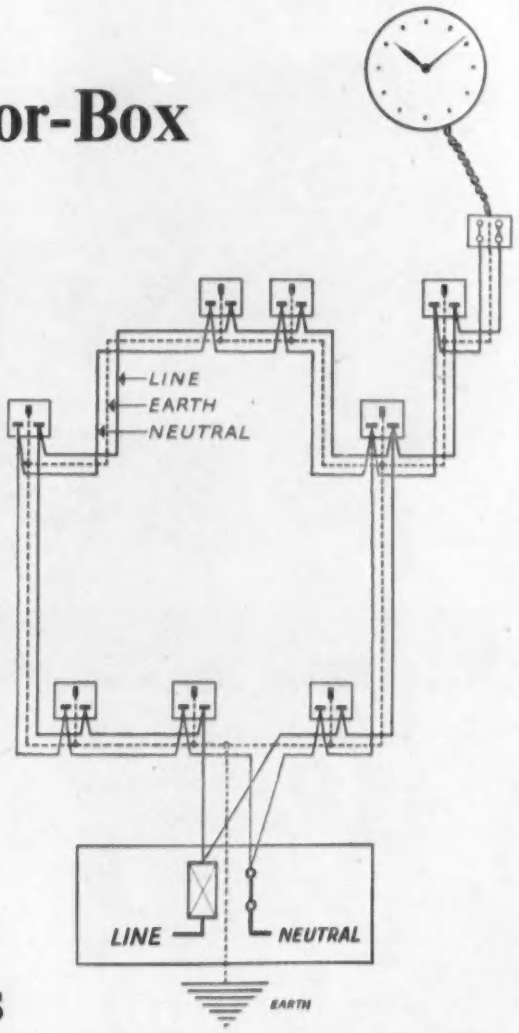

. . . for use on Ring Circuits

This new accessory has been designed to enable clocks (and similar fixed appliances) to be looped from a ring circuit. The fused connector-box has terminals that will accommodate 7/.029″ twin and earth cable, and is fitted with a 1 ampere cartridge fuse-link to B.S.646:1944 type A. The unit has 2¼″ fixing centres to suit standard boxes to B.S.1363. The back projection is extremely shallow so that the accessory will also fit into plaster-depth boxes to avoid the need for chasing brickwork.

Write for details.

. . . the mark of leadership

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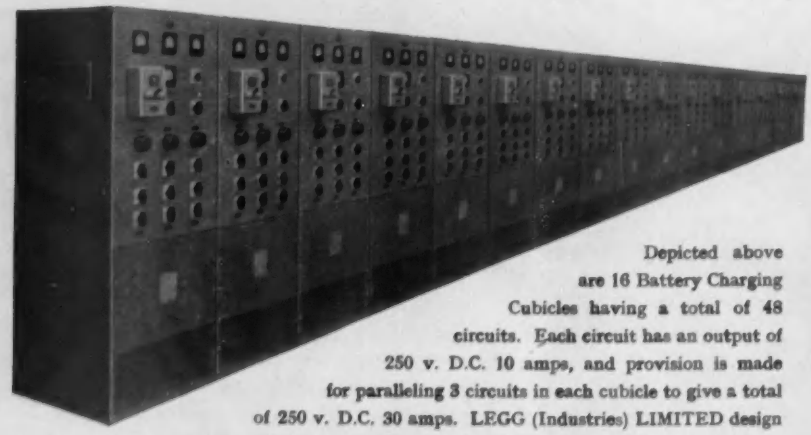
MK 115 DHB

16 BATTERY CHARGING CUBICLES

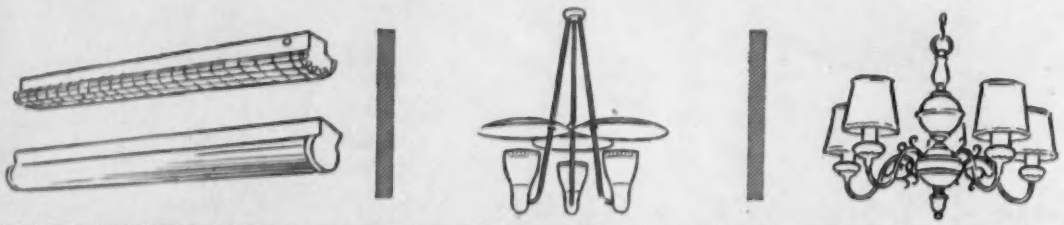


This panel has been specially designed and manufactured for an overseas customer.

Depicted above are 16 Battery Charging Cubicles having a total of 48 circuits. Each circuit has an output of 250 v. D.C. 10 amps, and provision is made for paralleling 3 circuits in each cubicle to give a total of 250 v. D.C. 30 amps. LEGG (Industries) LIMITED design and manufacture equipment incorporating metal rectification for all purposes where a D.C. supply is required from an A.C. source, also Transformers. Air Cooled and Oil Immersed, up to 150 kVA Capacity.

Legg (INDUSTRIES) LTD · WILLIAMSON ST · WOLVERHAMPTON

A section of the rear view of 3 typical cubicles.



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Lighting Engineers
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for all
Industrial, Commercial and Decorative purposes

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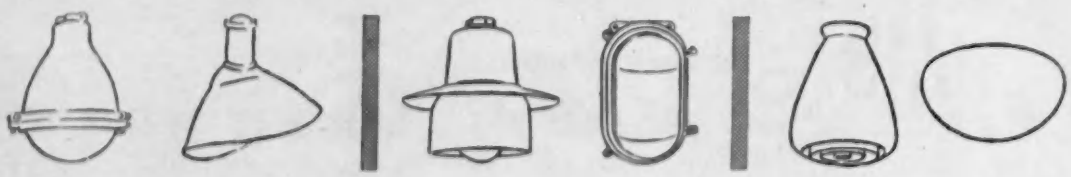

SIEMENS BROTHERS

POWER CABLES

with

P.V.C. continuous extruded sheath

OVERCOME CORROSION PROBLEMS

P.V.C. protects power and telephone cables from elements likely to cause corrosion. It is mechanically strong, resistant to abrasion and is unaffected by soil compounds. It is non-inflammable, does not deteriorate markedly with age and so protects the cable throughout its working life. Suitable for all cable diameters. All enquiries are welcome.

Power Cable with P.V.C. Sheathing under and over the armouring wires.

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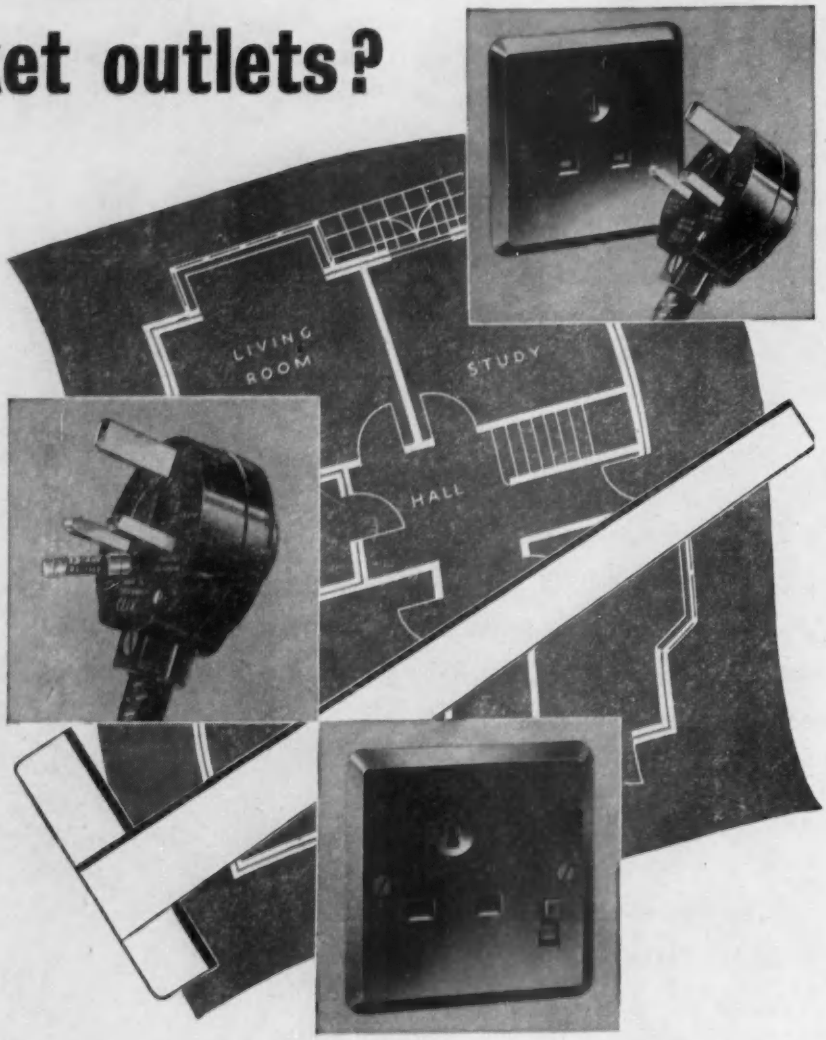
WOOLWICH · LONDON · S.E.18 TELEPHONE WOOLWICH 2030

Member of the A.E.I. Group of Companies.

how many socket outlets?



For an efficient and well-planned job make sure there are adequate numbers of Socket Outlets in each room, and remember to specify the Windsor range of Ediswan Accessories. These are quality Accessories at competitive prices, and the range includes all types of 13-amp. socket outlets, switch socket outlets and rectangular pin fused plugs for normal installations. The Ediswan plug that can be re-fused in 15 seconds, without the use of tools, is also available.

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THE H.W. RANGE of switch fuses is designed for use out-of-doors in dust-laden and corrosive atmospheres. The totally enclosed heavy cast iron cases are completely weatherproof.

The range includes single pole and neutral, double pole, triple pole, triple pole and neutral. 20, 30, 60 and 100 amps.

For further information about the H.W. Range please send for Switchgear Bulletin X2692.

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Unnecessary I feel, my dear chap

It's all very well you saying that our advertising must be unusual and stimulating and what have you,

but I'm sure that commercial artist bloke is laughing at us, and my head hurts abominably.

Can't think why you had this idea of making *us* into a PYRAMID!

I mean the message we have for people in the Trade is perfectly straightforward.

Why couldn't we stick a row of saucepans in the thing and say 'these saucepans are the best in the land.'

They've only got to look at them to know that anyway.

Got a reputation for quality, my dear chap.

HAGUE & McKENZIE LTD., PYRAMID WORKS, SLOANE STREET BIRMINGHAM, 1. CENTRAL 5912.

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IN THE NATIONAL WOMEN'S MAGAZINES

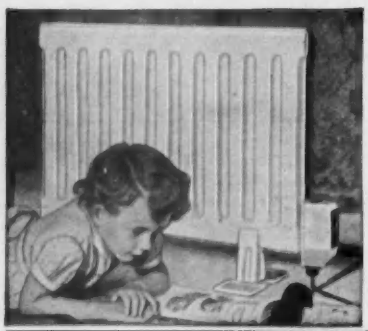
Larger and more frequent insertions in the

NATIONAL DAILY and SUNDAY PAPERS

29,000,000 appearances in the Leading Journals of home and family interest, in a concentrated campaign of advertising, from September 1955 to March 1956, will bring the Hurseal Heat story right into every home in the country. It will be even easier this season to

PROFIT with HURSEAL

ATTRACTIVE *NEW* PORTABLES

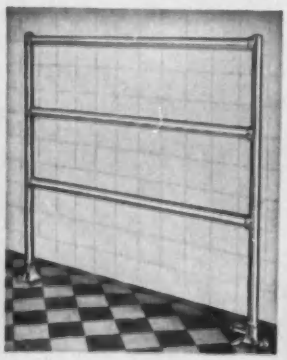


The New Hurseal Minor, a ½K.W. Portable is shown above. At the left, the attractive new ¾K.W. Column is proving a popular seller. Another new Panel is the T.V.¾. There is also the usual wide choice of Panels and Columns for portable use or permanent fitting, ranging in price from £11. 18. 9d. inc. P.T. All, of course, with Hurseal Built-in Thermostat.

HIRE PURCHASE PLAN

LARGEST PERCENTAGE OF ALL SALES TODAY ARE TO H.P. BUYERS

Hurseal products last a lifetime and are ideal for H.P. A special folder is available showing examples of deposits and easy terms which are certain to attract greater trade. Write today for a supply of special H.P. Leaflets



HURSEAL-LEDA

Oil-filled Electric Safety

TOWEL RAILS

Demand for comfort in the bathroom and ease of fitting a Hurseal-Leda Towel Rail makes it a sure and steady seller, and, in many cases, it is the only alternative for a home without central heating.

Write today for a copy of the Hurseal Times.

HURSEAL LTD.,
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LONDON, W.1.
Tele: REG 1051

NEW ELECO "PERSPEX" FITTING FOR INDUSTRIAL CONDUIT LIGHTING

—Increases Light Output Ratio 10-15%

This new Eleco fitting (patent applied for) is efficient, versatile and economical. It can be used either open, or made completely dustproof with a diffuser cover. The reflectors are made in two grades of opal 'Perspex', whilst the covers are obtainable in three grades, including a pinspot pattern "Perspex". This means that a suitable combination can be arranged to control the percentage of upward light and brightness over a considerable area. Thus, units can be selected to give the best lighting effect for your particular installation.

TOTAL THESE FEATURES— AND YOU GET TODAY'S MOST EFFICIENT LIGHTING

For 100 to 500 watt tungsten Lamps, 80-125 watt MB/V Mercury.

Lighting output Ratio exceeds 85%. Balanced distribution— 10-25% upward light.

High mechanical strength— Resists corrosion.

Low initial cost.

Ease of installation.

White stove enamelled interior.

For further particulars or help on any lighting problem write to:

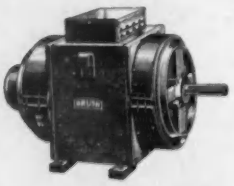
ELECO

ENGINEERING & LIGHTING EQUIPMENT CO. LTD.

SPHERE WORKS, ST. ALBANS, HERTS.

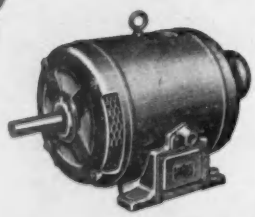
Get EXACTLY what you want

The Brush factory at Cardiff specialises in components for manufacturers of electrical equipment. Every unit is designed to meet the maximum stress of the most exacting service life — not just to fill the minimum requirements of a specification. MADE BY BRUSH means that a product possesses the extra strength and stamina to provide a margin of safety when it is most needed. Anyone interested in competitive prices and on-time delivery should get in touch with BRUSH.



Brush Square Path Alternators are built in a wide range of sizes with outputs from 1½ to 35 kVA, self-regulating, self-exciting. All Brush-built alternators can be bought complete with Control Switch Gear.

Brush High Rupturing Capacity fuse links are used by leading manufacturers all over the world. Their range covers current rating from 2 to 300 amperes. (A.S.T.A. certified.)



All Brush small motors can conform to BSI, CSA or NEMA standards. So wide is the Brush range that your ' special ' may already be among our existing types.

you get **exactly** what you want... from **BRUSH**

BRUSH ELECTRICAL ENGINEERING CO. LTD., HOPKINSON WORKS, CARDIFF · MEMBER OF THE BRUSH GROUP

and now

ATLAS Popular PACKS

IN 3 SIZES!

5 ft £4·19·8 INC. P.T.

4 ft £4·7·2 INC. P.T.

2 ft £3·15·2 INC. P.T.

Each pack contains :

ATLAS WHITE TUBE

***Fluorescent Batten* FITTING**

CONTROL GEAR—*tapped for all voltages*

ABSOLUTELY COMPLETE

Thorn *From your wholesaler or*

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Custom Built by

BKS

Multi-Motor Control Panels and Sequence Control Panels

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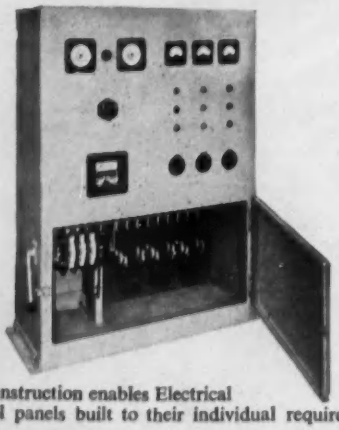
Designed and Built to

Specific Requirements



B.K.S. design and construction enables Electrical Engineers to have control panels built to their individual requirements at moderate costs.

B.K.S. electrical equipment is used extensively by leading authorities and organisations. Our Technical Advisory Service will be pleased to advise on the application of all types of control gear.

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TERMINAL TAGS

Designed for fixing between terminal screw and insulating base.

Manufactured from rigid P.V.C., non-inflammable, non-hygroscopic.

Standard colours are Black and White, but other colours can be made specially.

Engraved as required

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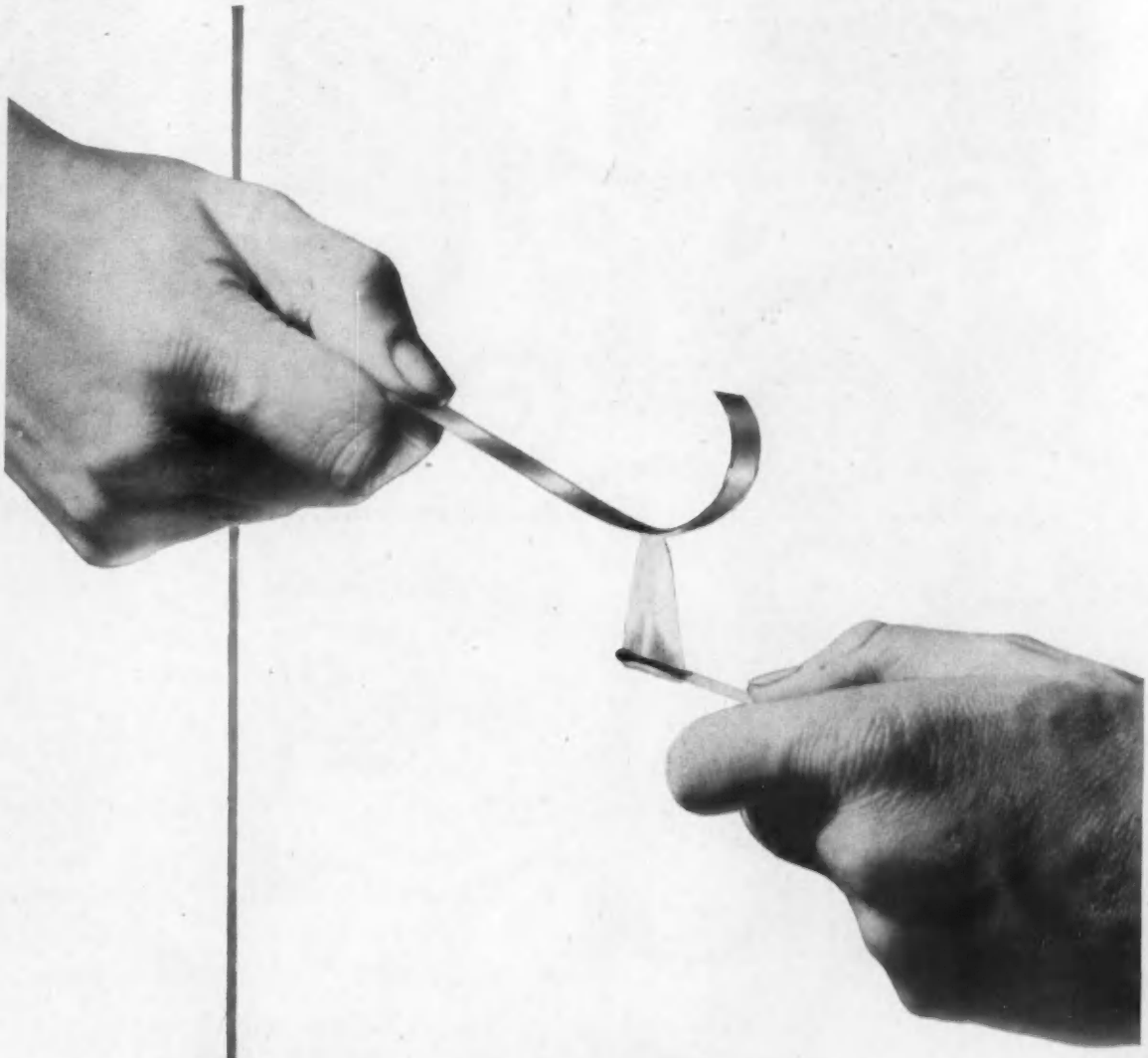

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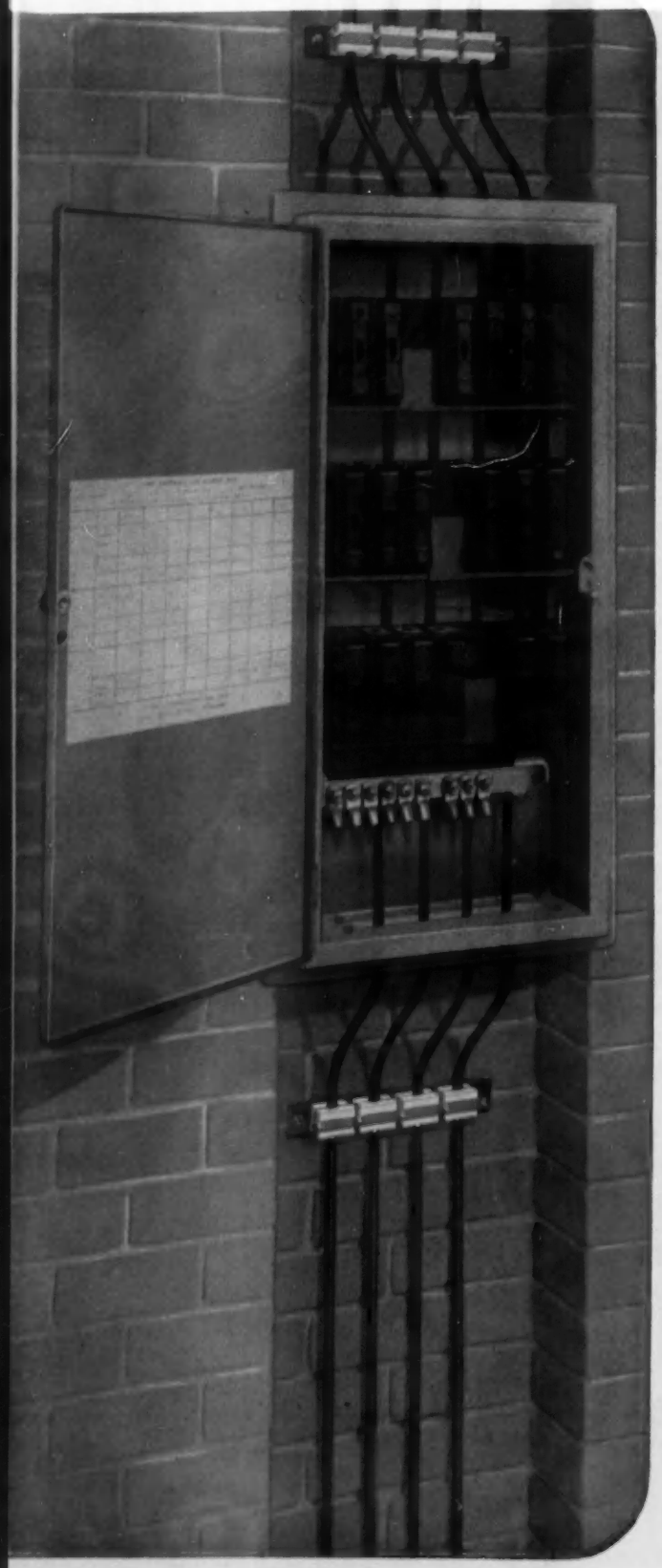

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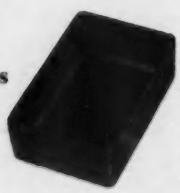

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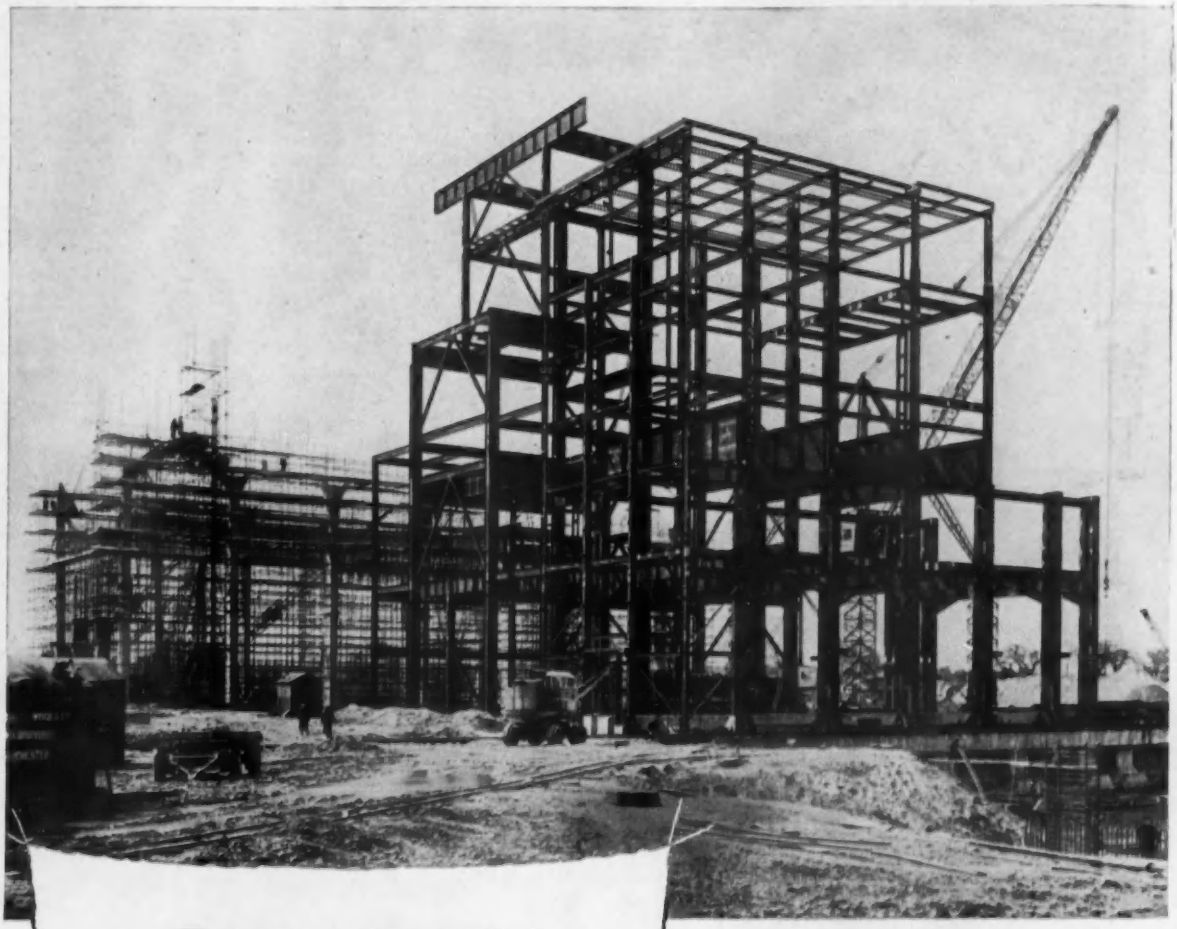

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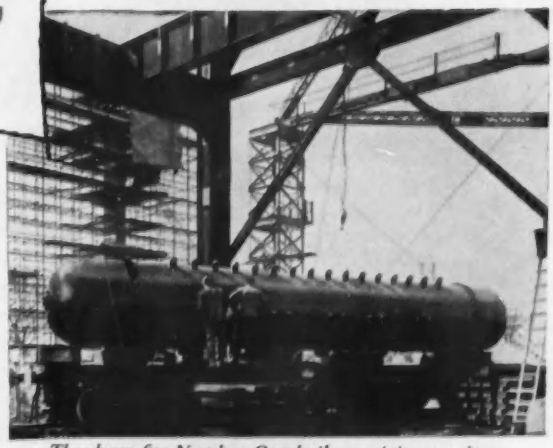

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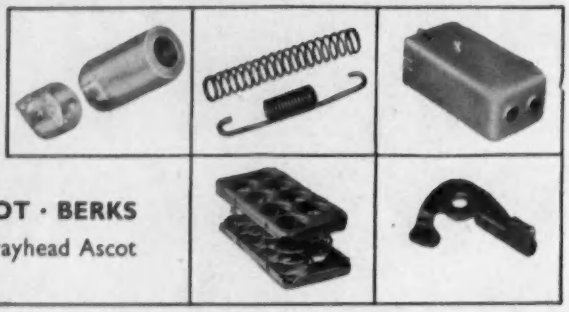

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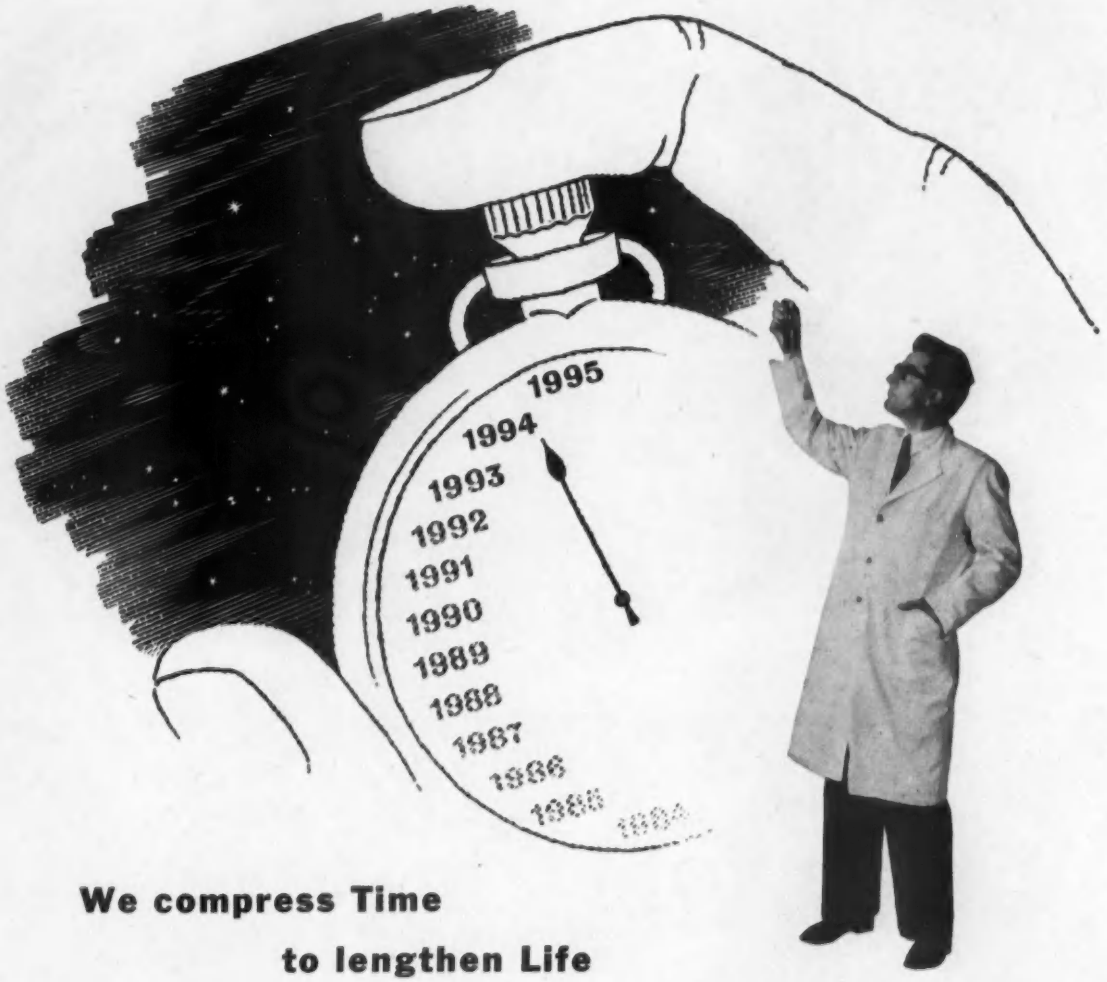

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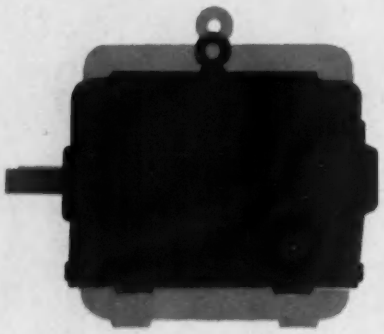

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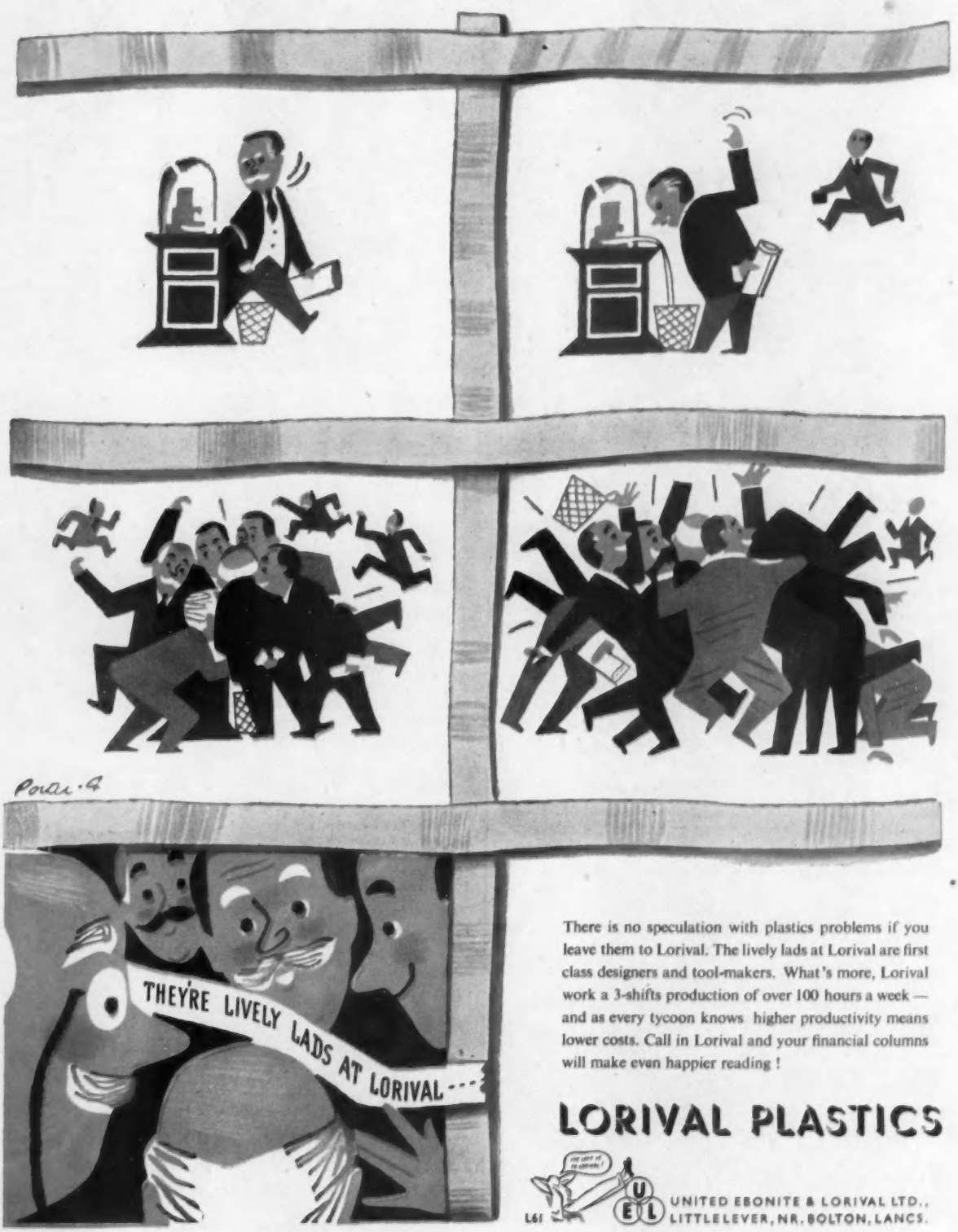

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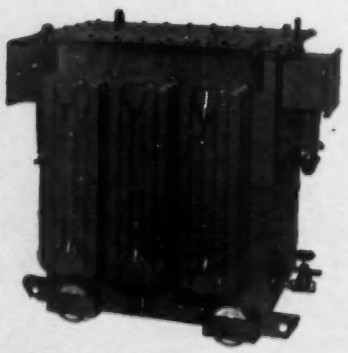

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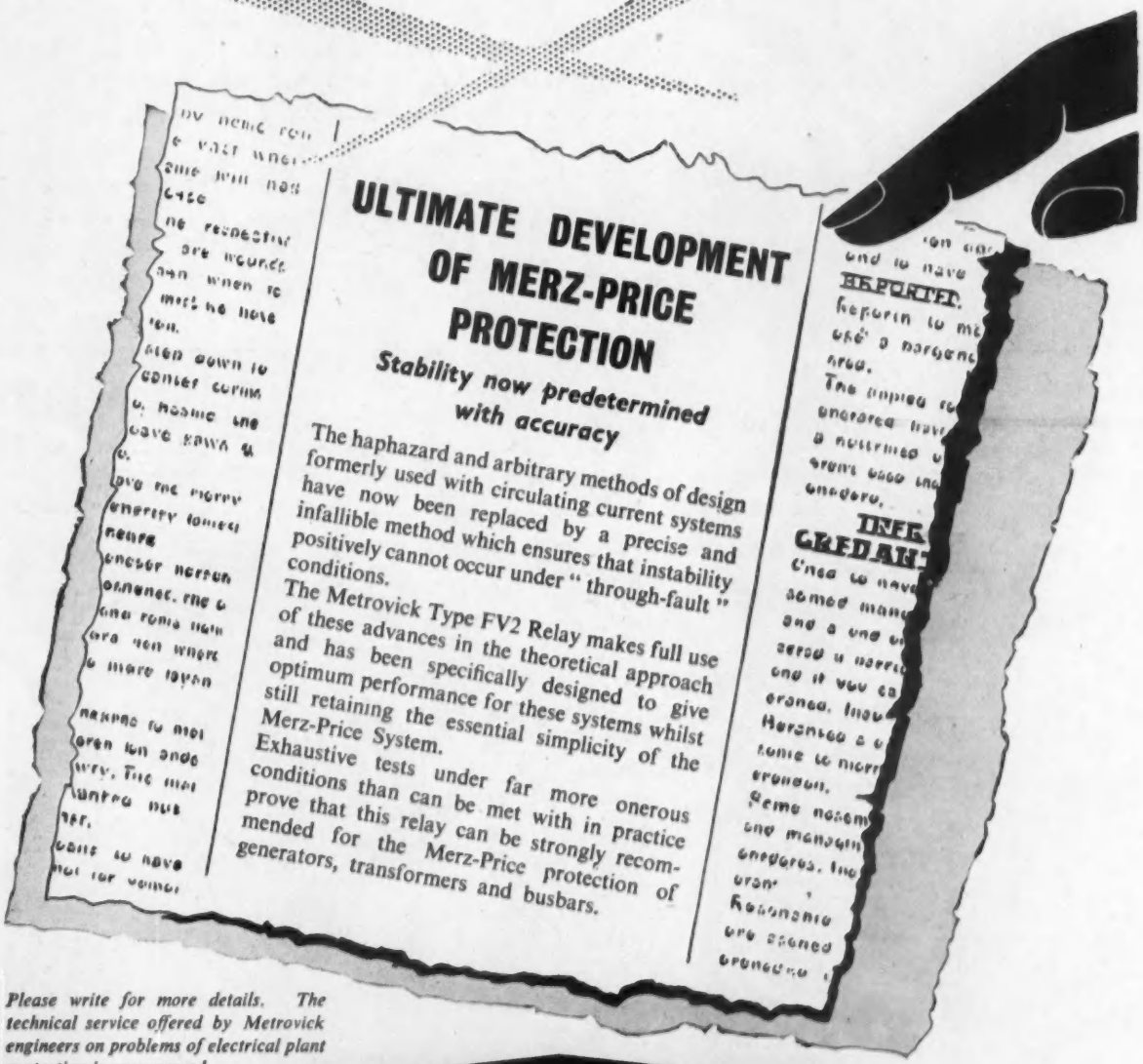
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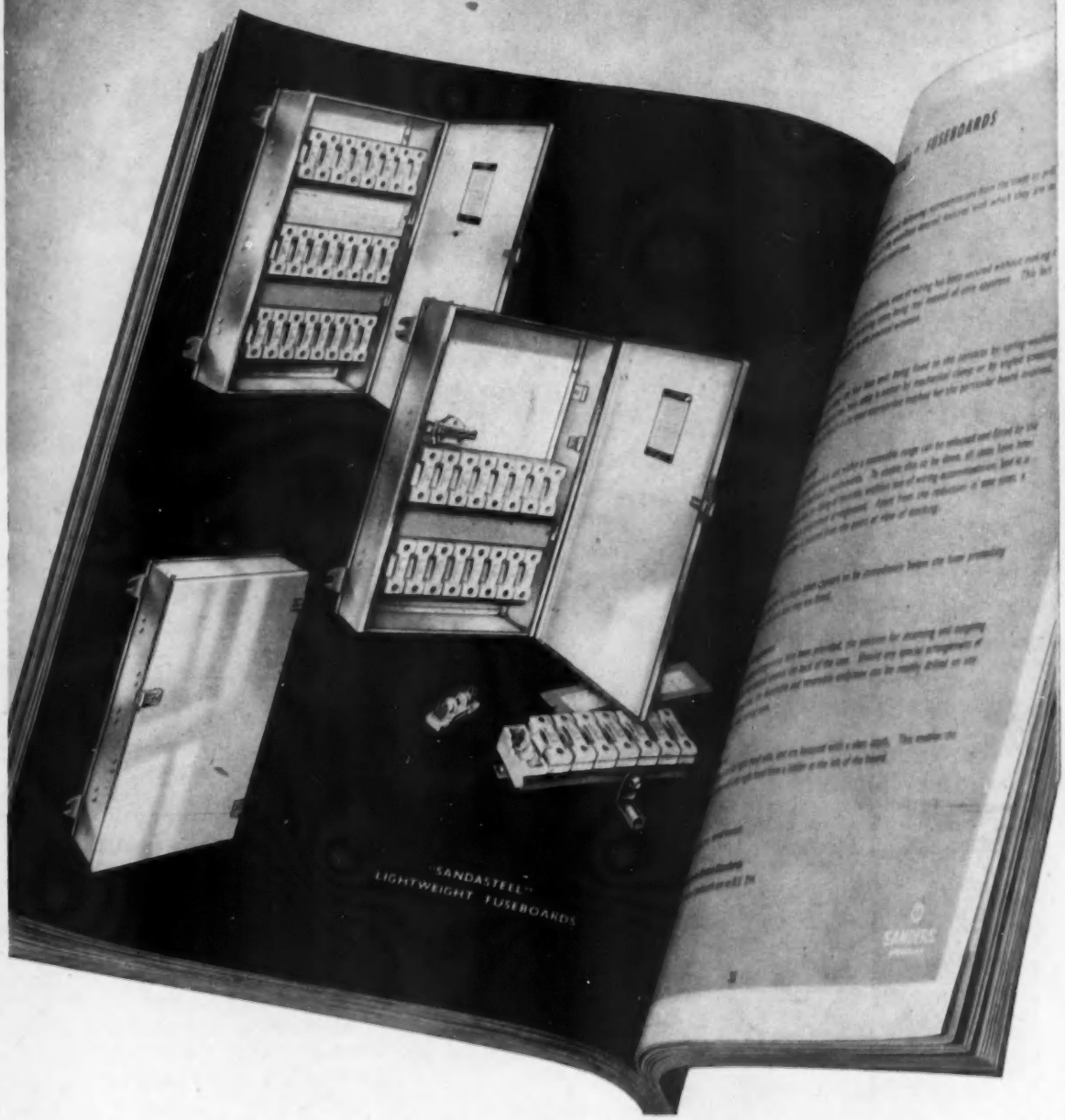

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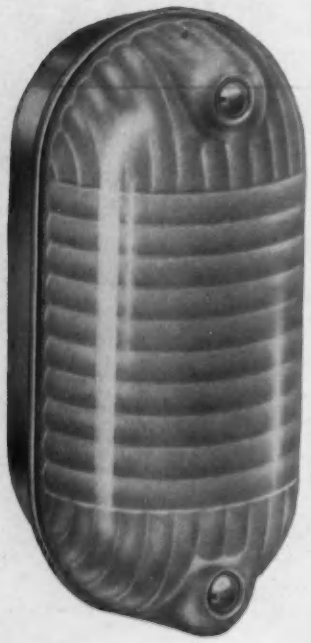

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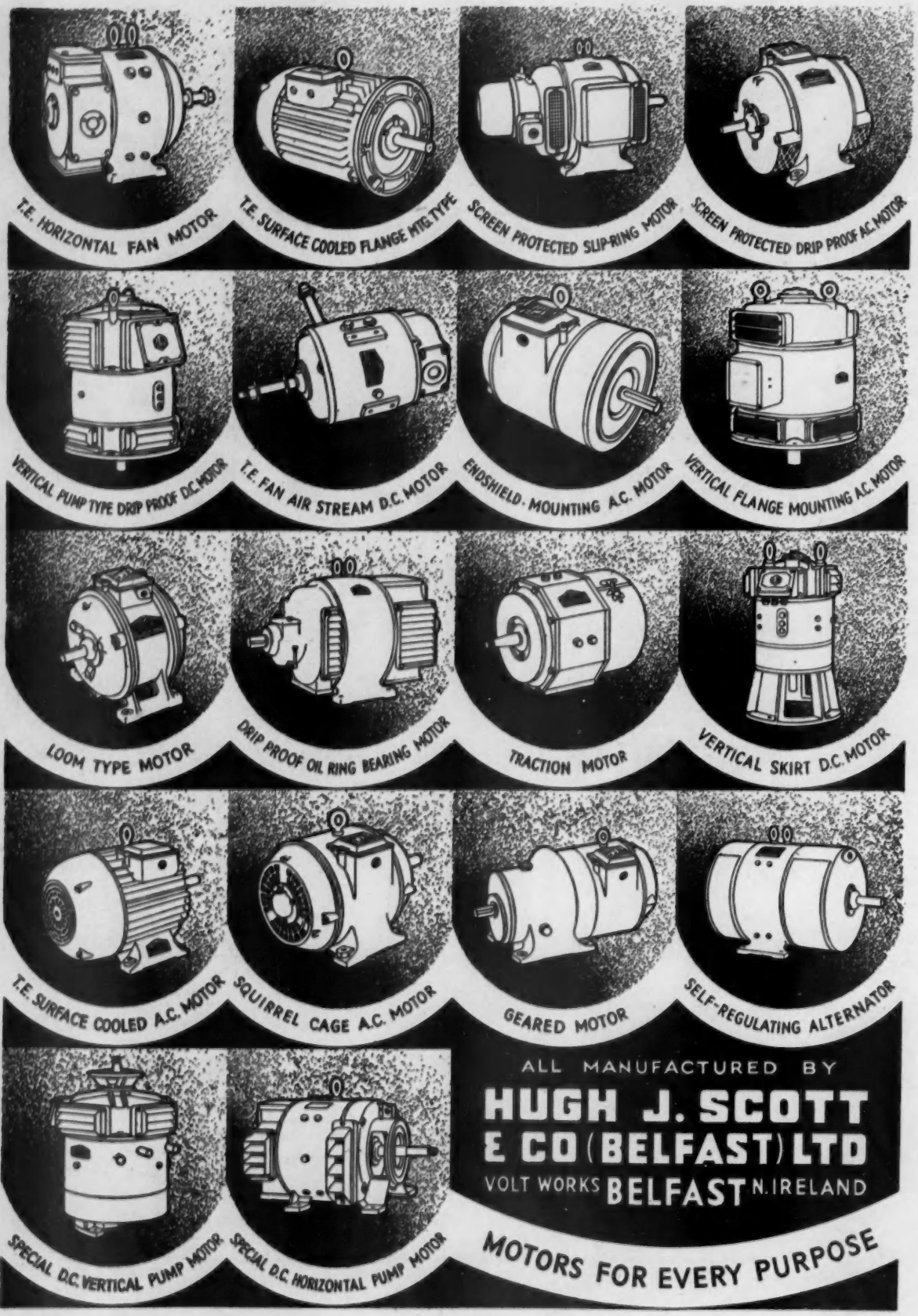
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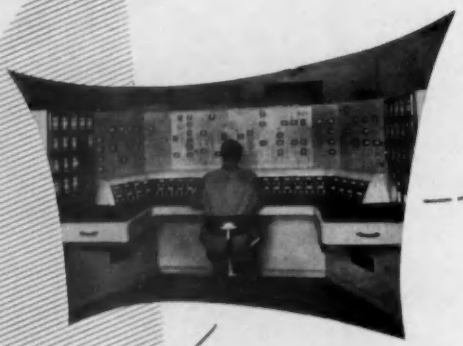

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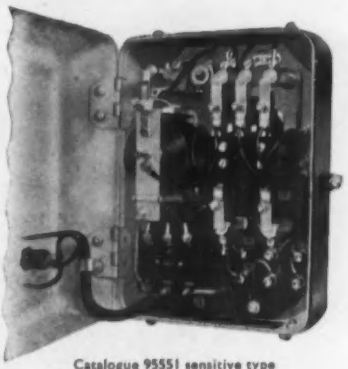
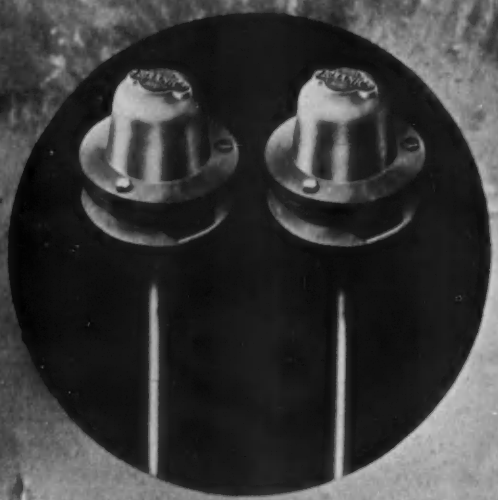


Catalogue 95551 sensitive type DIPSTICK water level control relay.

DIPSTICK WATER LEVEL CONTROL



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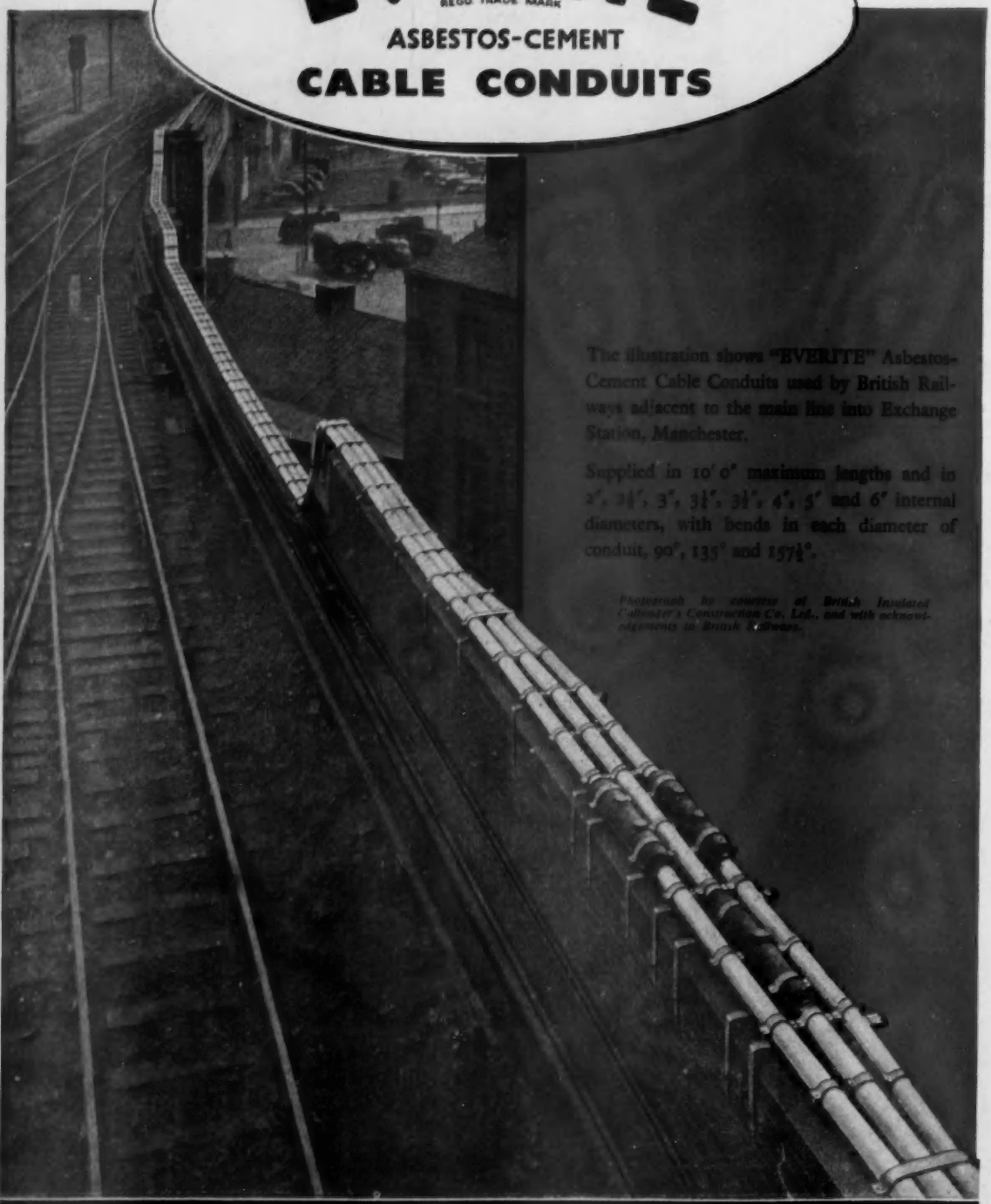

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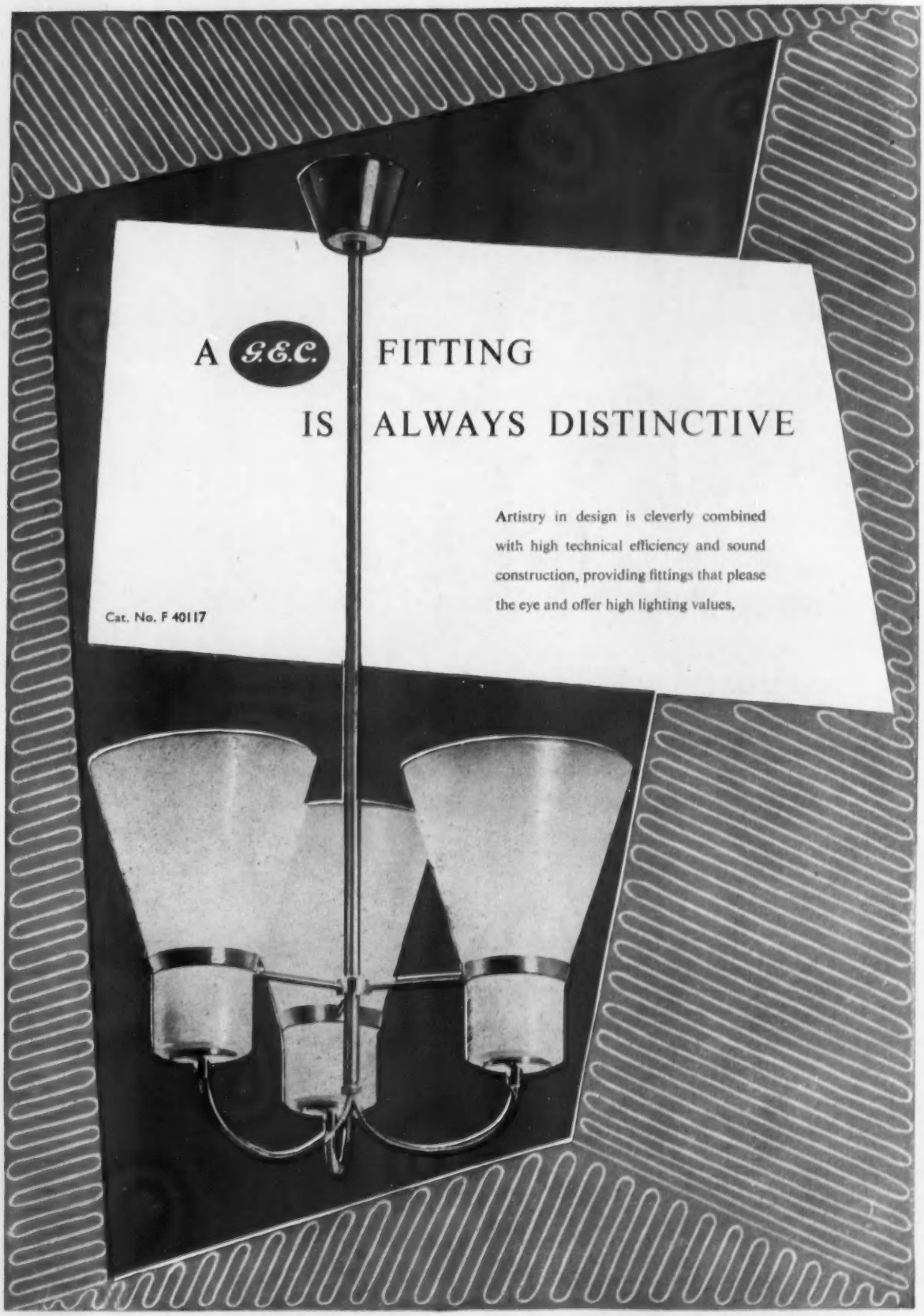
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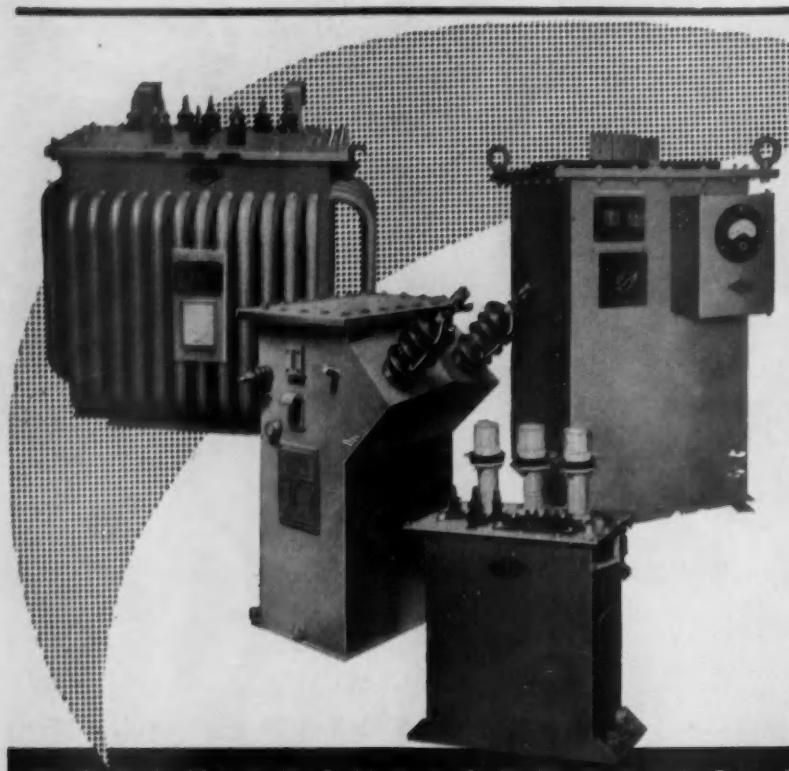

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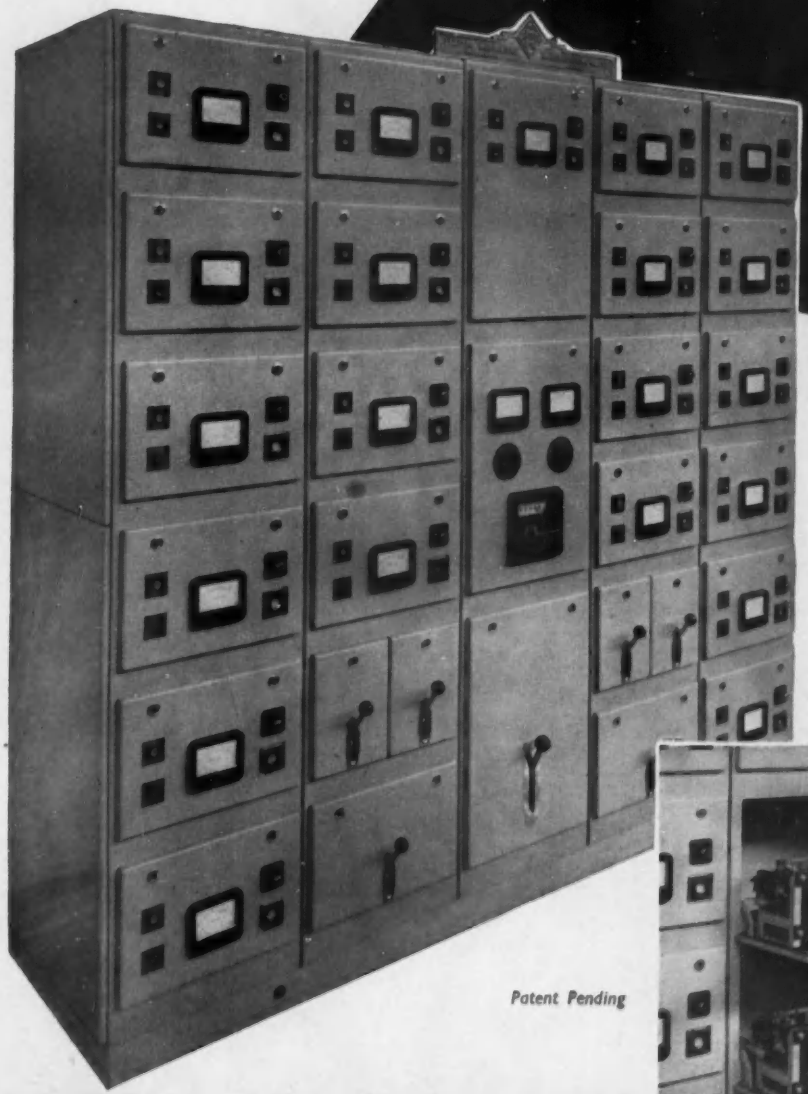

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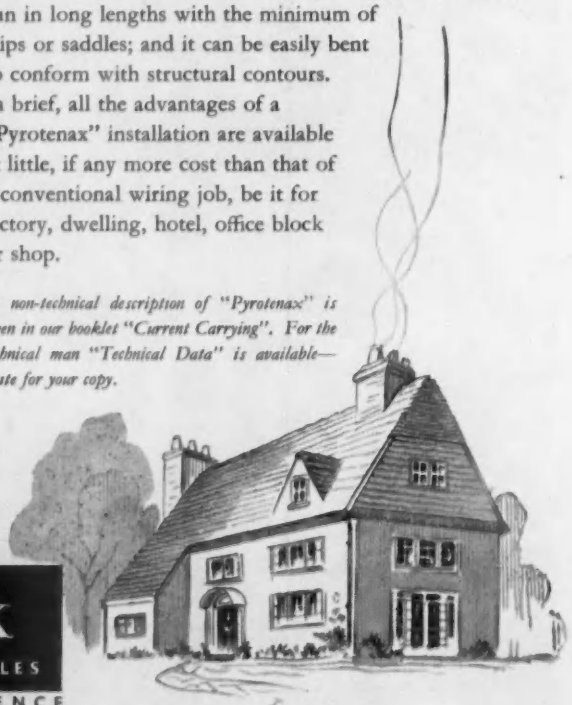

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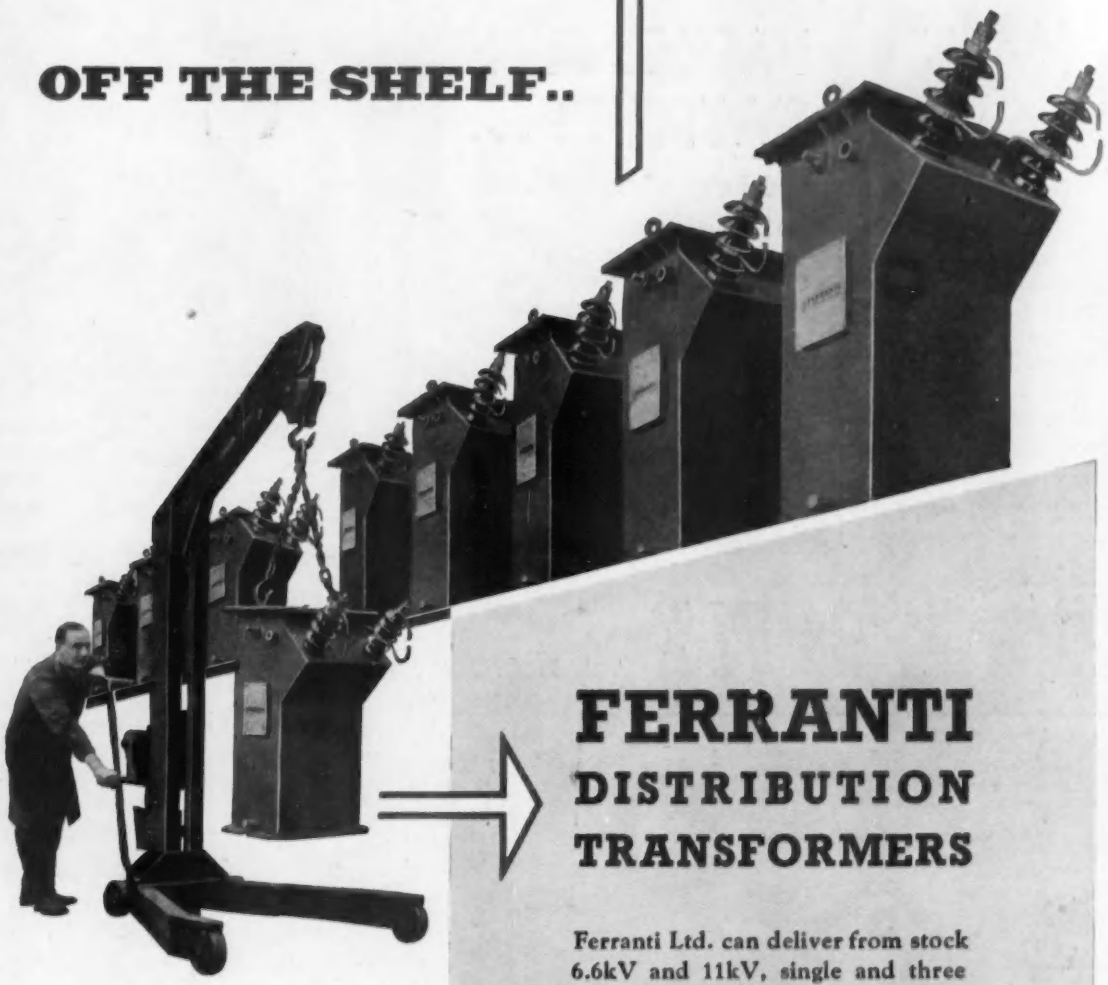

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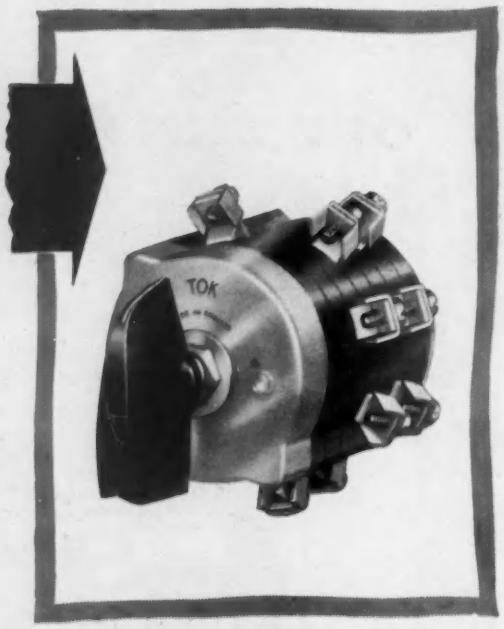

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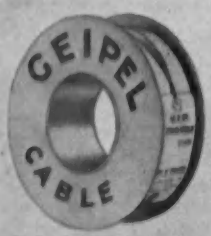

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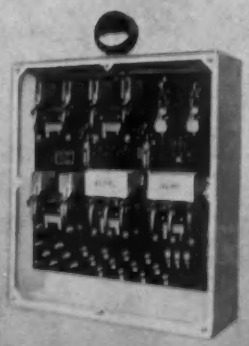

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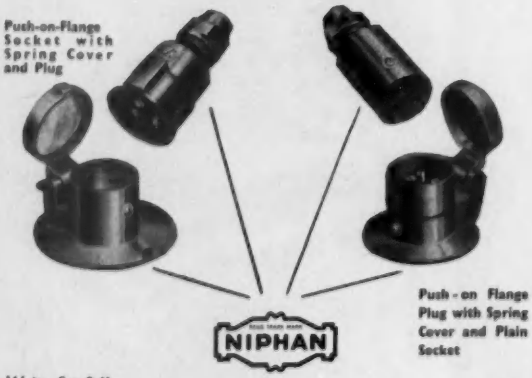

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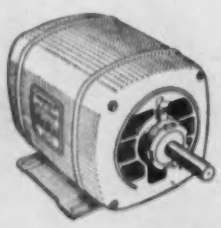

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D

NO TENDERING MERCIES

There has been so much talk of common prices in public tendering and official comment on the sins of firms who adopt such practices, that the reference last week of the subject of collusive tendering to the Monopolies Commission has excited little comment. Everyone expected it, no one was surprised when it was published. In this lies a danger of accepting the terms of reference at their face value and in not closely scrutinising the full scope of the resulting forthcoming inquiry. The main operative clauses are drawn in the widest terms, they are in no sense limited to public tendering and if it were not for the subsequent limiting clauses there is hardly an agreement on prices that would not come within their ambit. Collective sanctions, since these have already been the subject of a report by the Commission, are excluded, and so are agreements between buyer and seller and between associated firms. The question of agreements on resale price maintenance, is not so straightforward. While normally they are outside these terms of reference, if they exceed the narrow confines of resale price maintenance, then to that extent they also are open for enquiry under the present reference. How far the Commission will wander in these wider fields opened up before them cannot be foreseen but it is quite clear that the enquiry will go far beyond the limits of common price tendering which was the primary cause of these new terms of reference.

ATOMIC YEAR

Although the U.K. Atomic Energy Authority only came into existence in July last year, its history is effectively continuous since the Ministry of Supply assumed responsibility for nuclear energy work at the end of the war. For this reason, little new information was to be expected in the first annual report of the A.E.A., published last week. Yet the report does serve to give renewed emphasis to two matters of immediate importance. The first concerns the range of the work being carried out in this country on power reactors. British statements at Geneva, when contrasted with those from U.S. sources, did seem to indicate that the British atomic eggs were being placed in very few baskets. The present report corrects any such impression to the extent of stating categorically that investigational work is proceeding on a number of types of power reactor, other than those now under construction at Calder Hall and Dounreay. This is not to deny that the main effort is necessarily being concentrated on a few types because of the relative urgency of Britain's need for nuclear energy; but beyond this lies the second of

the matters on which the report throws added light. The shortage of senior technologists which affects so many branches of Britain's engineering industry at the present time bears particularly hard on the Atomic Energy Authority. It is not only nuclear physicists who are lacking; the need is fully as much for engineers who can convert laboratory ideas into engineering hardware. The report makes it clear that the question of salaries is a difficulty here. The Authority has to avoid salary scales widely different from those of the civil service, and this undoubtedly loses them some men. But to raise salaries is by no means a complete answer. The engineers required could only be obtained at the expense of industry, and, as the report shows, industry is already contributing extensively and successfully to the nuclear energy programme.

CHIMNEYS AND POLLUTION

In the early industrial era, the function of a factory chimney was twofold. It had to provide the necessary draught for the furnace and secondly it raised the products of combustion to a height where they could disperse without causing undue pollution at ground level. Today, the function of a chimney in a large industrial plant is almost wholly devoted to ensuring the maximum dispersal, the draught being usually under the direct control of the boiler operator. The plant designer has, however, been handicapped to a large extent by lack of information on the behaviour of the smoke emission after it leaves the chimney, and for power station work has generally accepted the principle laid down by the 1932 Report of the Committee appointed by the Electricity Commissioners that the chimney height should be two and a half times the height of the adjacent building. According to the paper presented to the Institute of Fuel by J. E. Hawkins and G. Nonhebel on the subject, this arbitrary rule, with few exceptions, has worked well. The paper, however, gives the results of recent work on the problem, and formulæ have been derived which enable the designer to locate, under specific weather conditions, the ground area of pollution, and the point of maximum concentration and adjust his chimney height accordingly. Such formulæ are of value where the direction and velocity of prevailing wind is stable for long periods of the year; in this country, where weather conditions are notoriously variable, their usefulness must be correspondingly diminished.

SCIENTIFIC MANAGEMENT

Technologists generally feel that in some way they are not reaping their rightful reward in a world which is pre-eminently theirs. Scientists and engineers are still too few in the ranks of management when measured against their importance in industry. Whenever the question comes up for discussion—as it so frequently does—the allegation appears that there is some shortcoming amongst technologists themselves which makes it difficult to promote them to the highest non-specialist positions. One aspect of this accusation was brought out by a speaker at the conference on "The Impact of Science on Management in the Future," organised by the British Institute of Management last week. He drew attention to the satisfaction that scientists so commonly find in their work, a satisfaction quite independent of the ultimate object for which the investigation concerned has been undertaken. Something of the same satisfaction in doing a job worth while in itself is to be found amongst engineers; but it will not do for a manager. He must have a definite objective in mind and must drive for it. It does not follow, however—and here is one point where those who underrate the management capacity of the engineer go wrong—that when the engineer or scientist is taken away from his self-sufficient job, he will fail to bring his trained qualities of mind to bear with all the desired awareness of the target. There are many examples from the increasing number of firms who promote their engineers to higher management positions that the transition will be safely made in most cases. As we have remarked before on this page, the greatest threat to the development of the engineer as a manager probably comes from his relative scarcity. Firms will be unwilling to promote to mere competency as non-specialist managers men who have outstanding qualities as engineers. The best will no doubt fight their way to the top; but for all others, their very qualities as engineers will prove a disadvantage.

SCIENCE IN GERMANY

German respect for the scientific approach in engineering has long been a byword. The part science is playing in the advance of Western German industry is well illustrated in the report that the British D.S.I.R. has published this week, and which is summarised on a later page. The very fact that the facilities provided are so up to date of course gives a real advantage, and there is a warning for British firms in the opinion of the report, that on average the buildings and the equipment in German research establishments gives the impression of being better than those in the United Kingdom laboratories doing comparable work.

WHOLESALE SERVICE

Self-service stores, so firmly established in the retail field in this country, break into electrical wholesaling this week with the opening of the depot at Truro which we describe on a later page. This is an imaginative step forward from the conventional showroom and trade counter, and it is apparent that the firm concerned, Sloan Electrical Company, have given considerable thought to all the details of their new venture, so that the potential advantages of the technique may be gained by the visiting contractor or retailer. But how far is he being placed in danger of extravagance? Housewives visiting the more normal grocery self-service establishment seem in some way mesmerised by the too-obvious availability of the goods set before them, and purchases are made which were never intended when the shop was entered. Is there any risk that the hardened heart of the contractor will be a little softened by the allure of seried ranks of attractively finished switchboxes? Furthermore, will the manufacturers, anxious to take advantage of this modern approach, take a new interest in the packaging of their mundane products? Some improvement here may have an effect on sales and on application that is wholly beneficial. But the really tricky question for the self-service wholesaler is—Where will he store his goods in short supply?

Meteor

Long Distance Transmission

FACTORS THAT DETERMINE DESIGN MAGNITUDES

By K. W. WARDROP B.Sc.(Eng), A.C.G.I., A.M.I.E.E.

TRANSMISSION of electrical energy over distances exceeding 100 miles has been greatly accelerated during the past decade. Progress in the art of transmitting power has been encouraged by, and has encouraged the development of power sources far from load centres. In this country it will enable power to be generated in the Midlands and consumed in other parts of the country at a lower overall cost than would be possible otherwise. In many other countries, hydro-electric schemes are being developed which depend entirely upon the transmission of power, as the local consumption at the generating station is virtually zero. There is no doubt that electrical power transmission is becoming increasingly important throughout the world, and it is the object of this article to review the problems involved, and the methods used to solve them at the present time.

In common with all engineering projects, there are no universal textbook solutions which may be applied to all power system transmission systems, for no two systems are identical. They may, however, be roughly classified as "closely interconnected" having the majority of generation and load close together, or as "isolated" systems. having the majority of the generation remote from the load. The size of the system, both in the amount of generation installed and the area of country supplied, varies a thousand-fold, and the variation in reliability of supply required is only one factor to be considered when proposing solutions to power transmission problems. However, for point-to-point transmission, a good yardstick of comparison is to multiply the number of megawatts to be transmitted by the number of miles they are to be transmitted or, MW-miles of transmission. Considering many factors such as size of conductor, losses, voltage regulation, there is an economic voltage level for any given number of MW-miles of transmission, and this relationship is shown in Fig. 1. The variation in system design is shown up by the rather wide band of the graph, but it will be seen that to transmit 500 MW, 100 miles or 250 MW, 200 miles, a voltage of about 250 kV is required.

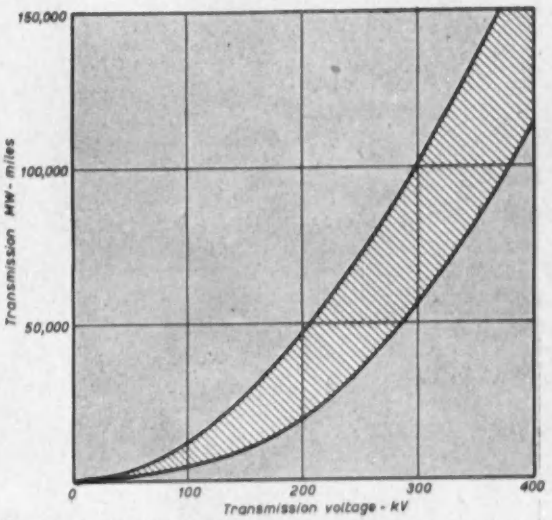


Fig. 1. The hatched band shows the economic voltage range for a given magnitude of megawatt-miles

High Voltage Operation

The problems of operating any apparatus at 250 kV, even in a laboratory, are considerable and for a transmission line extending some hundreds of miles the corona problem is perhaps the most severe. The local breakdown of air near the conductor, with its attendant hissing noise, losses, radio and television interference, is dependant upon the voltage gradient at the surface of the conductor. Thus by increasing the size of the conductor the voltage gradient will be reduced, for this voltage gradient is approximately $V \div \left(r \log_e \frac{d}{r} \right)$ where V is voltage between two conductors radius r having spacing d between centres. This method of reducing corona has been achieved in two ways. Firstly by the direct approach, using hollow conductors, and incidentally steel-cored-aluminium conductors have an inherent advantage from this point of view, and secondly by an indirect method using several conductors per phase, known as composite or bundle conductors. These conductors act together as a single conductor of much larger diameter than any of the component conductors, and thus the corona level, or working voltage at which corona commences is higher than for any of the component conductors used separately. A practical solution to the corona problem is to use two conductors for each phase, and these give an equivalent conductor of about 1·8 times the diameter of the component conductors for 10-15 diameter spacing between the conductors. The effect of this method upon the voltage gradient is shown in Fig. 2 which gives the field formation and voltage gradients around single and double conductor arrangements. The twin conductors have to be spaced apart between towers and this involves mechanical difficulties in the form of conductor twisting.

A high voltage line has one great advantage, and that is its relative immunity to lightning discharges, the greatest cause of outages in low voltage overhead lines. The probable distribution of lightning discharge currents is shown in Fig. 3, and so a typical discharge current may be around 50,000 amps. Now an average value of surge impedance of a conductor to earth is 15 ohms, and so voltage surges of the order of 750 kV peak may be expected on the lines. This may be only of the order of twice the normal operating voltage of the line, and the line can be designed to withstand such voltages. More important than the basic insulation level of the line, is the interrelationship between the voltage levels of all apparatus connected to the line, or insulation co-ordination. This involves knowledge of the impulse breakdown strength of insulators, rod gaps, lightning arresters, transformers, switchgear, etc., to ensure that breakdown always occurs at a rod gap or where the least possible danger will result. Typical curves of breakdown are shown in Fig. 4. Overhead lines are now in operation up to 400 kV and the

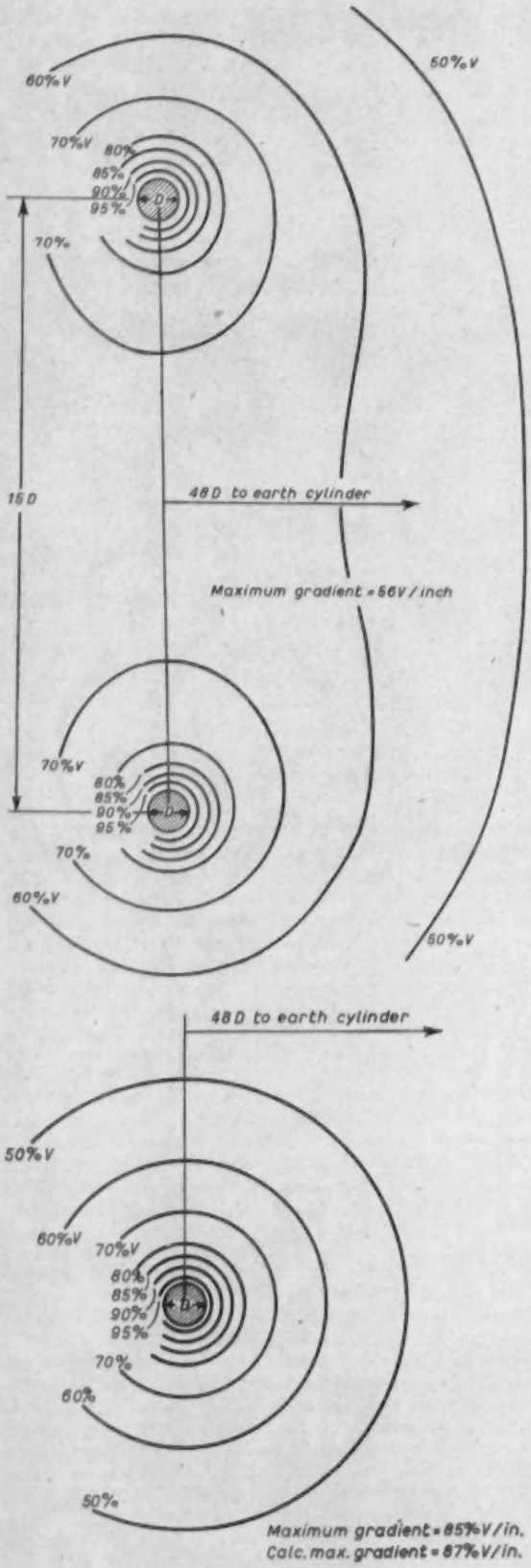


Fig. 2. Left, these two diagrams show to scale the equipotential lines for a single conductor (below) and a double conductor (above). The reduction in maximum potential gradient obtained by using bundle conductors is apparent

problems of high voltage, as such, are perhaps the least troublesome for power system designers.

Steady Load Limits

Every power transmission scheme should operate under steady load conditions, even although it may fail under shock loading or fault conditions. Oft-times the most onerous of these is, curiously enough, the off-load, open circuit, or line charging condition. It may be difficult to supply sufficient charging current to energise the line, particularly in the initial stages of a scheme, and if the line is long enough, the voltage at the far end of the line may be excessive. Even for a 200 mile line the rise of voltage on no-load is about 6% of the sending-end voltage, as is shown in Fig. 5. The average capacitance of an overhead line is 0·015 μF per mile, and this means that a line operating at 132 kV takes 0·36 amp per mile, and a 300 kV line 0·82 amp per mile on open circuit. Expressed in terms of charging MVA, and that is the critical factor as far as machines are concerned, a 100 mile line at 132 kV requires 8 MVAr and at 300 kV, 41 MVAr.

To supply charging current a machine has to be under-excited and had a tendency to drop out of synchronism in that condition. Thus there is a limit to the amount of charging MVAr than can be drawn from any machine,

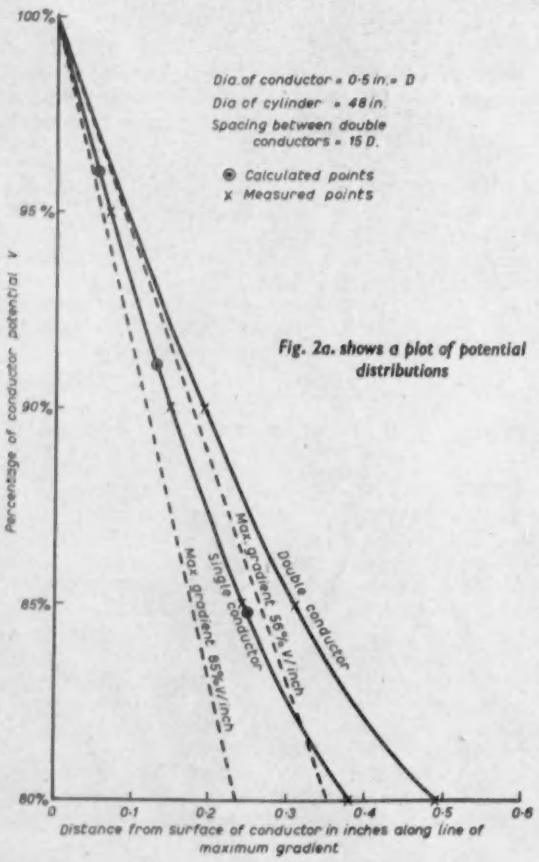


Fig. 2a. shows a plot of potential distributions

Fig. 4. Top right, voltage-time breakdown curves for transmission line equipment exposed to surges

Fig. 5. Centre right, the capacitance effect causes the voltage on long overhead lines to rise in the manner shown here for a representative line. Capacitance is taken as 0·015μF/mile

and is usually less than the MVA rating of the machine. It is sometimes possible to isolate a machine on to a line and increase the voltage gradually, and with the aid of a shunt reactor, synchronous condenser or other load, to energise the line at full voltage. Another method is to switch a synchronous condenser or a similar machine across the line at standstill before energising the line, and so use the machine as a reactance coil until it runs up to speed. Serious overvoltages may occur when lines are switched out of service whilst carrying load due to excess voltage on the generators, and it is often necessary to arrange the switchgear so that the sending end of the line is tripped out first. The difficulties of line charging and line handling call for close co-ordination between engineering and operating staffs, particularly on new schemes.

Assuming that the power system is energised, what are the limits to which it can be loaded? The most obvious limit is perhaps that set by the overheating of the conductors. A steel-cored aluminium conductor as used on the majority of 132 kV lines in this country has a thermal limit of 700 amp or 160 MVA, and it is rare that this limit would be reached except on short lines, because of the voltage regulations, danger of cascade tripping or other limits. On higher voltage lines, where the conductors have been increased in cross-section to reduce corona, the possibility of overheating the conductors is remote. A great danger from heavy loading occurs in a closely interconnected system where if one line trips out on overload, or for any other reason, that load is immediately transferred to some other line with the possibility of tripping that one out. This process of cascade tripping may well shut down a large area of supply.

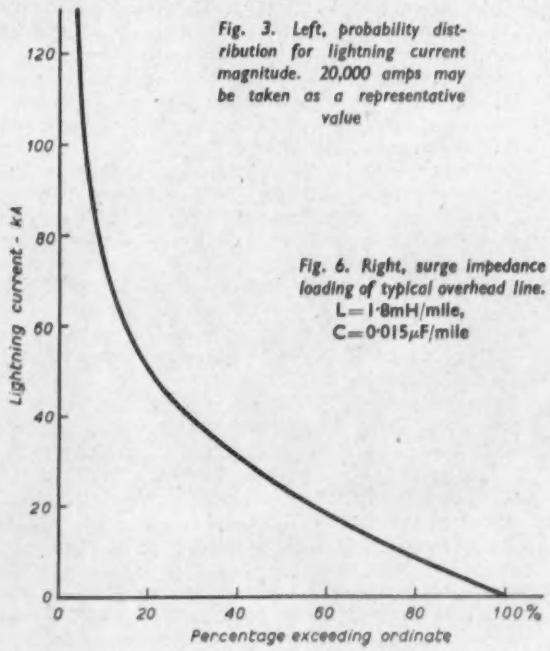
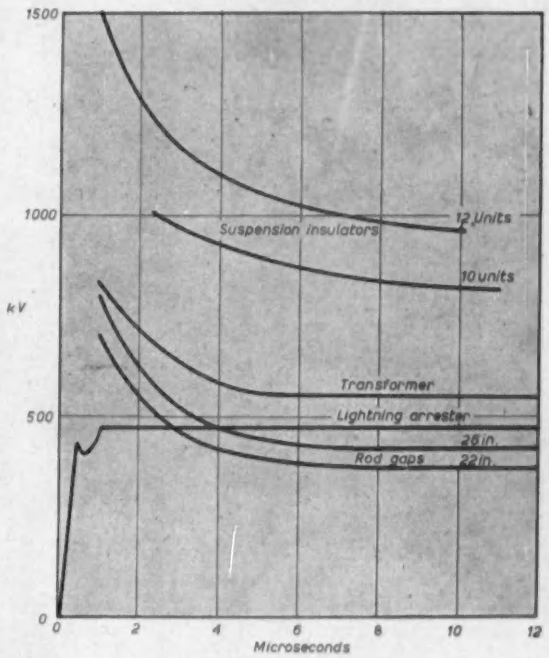
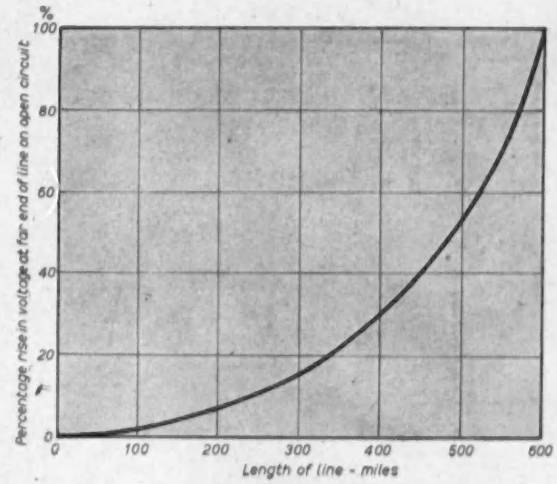
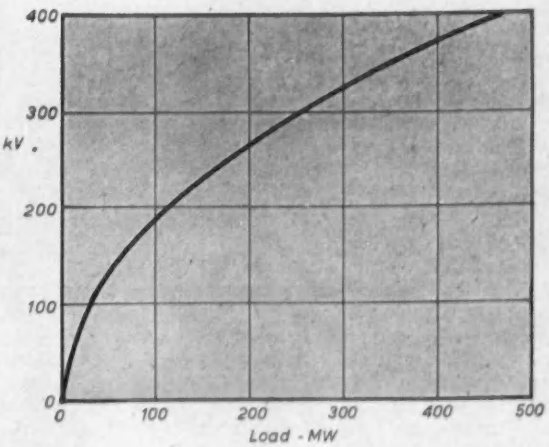


Fig. 3. Left, probability distribution for lightning current magnitude. 20,000 amps may be taken as a representative value

Fig. 6. Right, surge impedance loading of typical overhead line. L = 1·8mH/mile, C = 0·015μF/mile







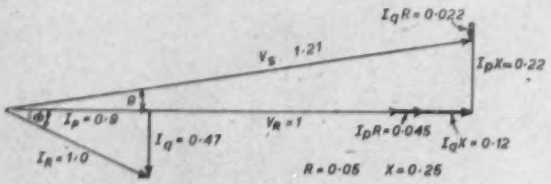


Fig. 7. Vector diagram for overhead line having reactance five times resistance, and carrying a load with 0·9 lagging power factor

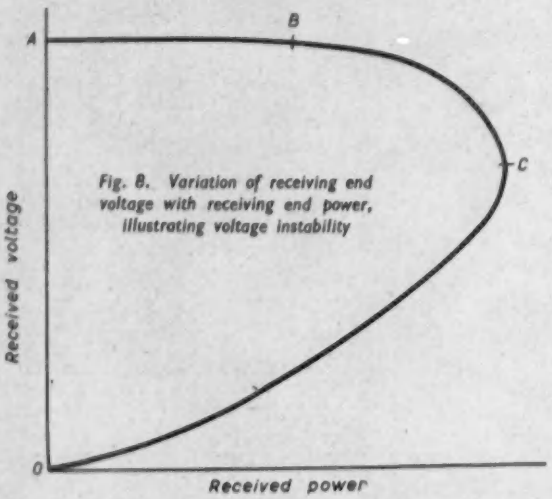


Fig. 8. Variation of receiving end voltage with receiving end power, illustrating voltage instability

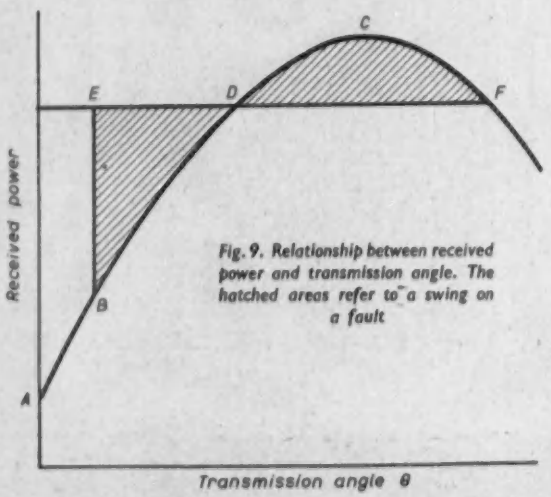


Fig. 9. Relationship between received power and transmission angle. The hatched areas refer to a swing on a fault

A good yardstick for the loading of any line is the surge impedance loading, that is to say, the MW which would be taken by a load having the same resistance as the surge impedance of the line. The impedance of a line to travelling waves or surges is given approximately by $\sqrt{\frac{L}{C}}$, and as the typical inductance L per mile of h.v. line is 1·8 mH/mile, and capacitance C is 0·015 μF/mile, the typical surge impedance is 350 ohms. This gives loads in MW for any given voltage as shown in Fig. 6. One useful feature of this particular load is that the net reactive losses in the circuit are zero, for the charging requirements are $V^2\omega C$ and the reactive loss $I^2\omega L$, so that when the sum of these two items is zero, i.e. $V^2\omega C = I^2\omega L$, then $\frac{V}{I} = \sqrt{\frac{L}{C}}$, where V is the phase voltage and I the phase current of the circuit. The loading of a circuit is influenced by factors such as generator and transformer impedance, number of line sectionalising points, type of switching and relaying, synchronous condenser capacity, use of series capacitors, etc., as will be shown later, but for distances between 100 and 300 miles, the maximum load may reasonably range from 0·9 to 1·4 times the surge impedance loading.

Voltage Regulation

Voltage regulation and control play an important role in power transmission and sometimes set the upper limit to the amount of power which may be transmitted. If the current received from a transmission line be considered as two components I_p in phase with the received voltage, and I_q, in quadrature with that voltage, then, as a first approximation, the voltage drop in the line is $(I_p + jI_q)(R + jX)$ where R and X are the total resistance and reactance per phase of the line. This gives an in-phase voltage drop of $(I_pR - I_qX)$ and an out-of-phase or quadrature voltage drop of $j(I_pX + I_qR)$. The vector diagram for a 0·9 p.f. lagging load with the reactance of the line five times the resistance is shown in Fig. 7.

The upper voltage limit is usually 10% above the nominal rating of the line to reduce insulator stresses, and the lower limit 20% below nominal, for if the voltage is any lower then it is impossible to restore the voltage on the distribution system. From Fig. 7 it will be seen that the most profitable method of controlling the voltage is by varying I_q, for I_qX is the largest in-phase component. This means controlling the power factor of the load, either by static capacitors, synchronous condensers or a combination of both.

Two types of instability can occur in the steady state operation of a transmission line, and fortunately both are very rare, although not unknown, in practice. The first is voltage instability due to overload, and the second a loss of synchronism due to the maximum power limit of the line being exceeded. If the sending end voltage of a transmission system be kept constant and the received load gradually increased, the received voltage will drop in the manner shown in Fig. 8. Normally systems operate over the range A—B, but it is sometimes possible to reach point C, when the voltage is very sensitive to power changes, and to operate at a low voltage in the range C—O. If the sending end and receiving end voltages be kept constant by generating plant and the receiving end load gradually increased, then the angle θ between the two voltages increases. There is always a trigonometric relationship between this angle and the power transmitted, as shown in Fig. 9. Normally systems operate over the range A—B, but should the load increase so that the point C be attained, then θ increases indefinitely, or in other words synchronism between the two ends of the system is lost. Factors to be considered in the steady-state operation of a transmission system are then, overloading the conductors; voltage regulation and control, particularly under live outage conditions; and avoiding voltage and synchronous instability.

Fault Conditions

Although the prime purpose of a transmission system is to transmit power under steady conditions, it is often desirable for it to ride through sudden disturbances such as shock loads or line faults. This factor of transient stability is of considerable importance in lone lines and may set the upper limit to the load that may be trans-

mitted for a certain degree of reliability in the continuity of supply. Instability is due to the relationship between machine rotor angles and their power output, as represented in Fig. 9, and, owing to the machines having inertia, the rotor oscillate with respect to their steady state relative positions after receiving a shock load. Consider a system operating at point B in Fig. 9, and a sudden load be applied so that the new operating point is D. Due to the mechanical inertia of the system, the point D cannot be achieved immediately, and machines have to accelerate and decelerate in a finite time to change their relative rotor angles. Having arrived at the point D, the machines have an excess or a deficit of energy, and the system will overshoot the point D. Dependent upon many circumstances, the system may overshoot to point F or beyond, or return to point D after further oscillations about this point. If the point F, where area B.E.D. equals D.C.F. is passed then the angle θ increases indefinitely and synchronism of the system is lost.

The same type of phenomena takes places when a fault occurs on a system. For the duration of the fault, the machines at the sending end of the system, particularly if the fault is near that end, will accelerate, and the machines at the receiving end decelerate or accelerate at a lesser rate. When the fault is removed the opposite occurs, the machine rotors oscillate and may or may not lose synchronism. Using a network analyser and a step-by-step calculation process, or a dynamic analogue these conditions may be studied in detail and a series of rotor position/time or swing curves obtained. Fig. 10 shows these curves for stable and unstable, or loss of synchronism, conditions. Shock loads on the system are usually small compared to the total generation capacity, except perhaps in the case of rolling mills on an isolated system, and they are, therefore, relatively unimportant as far as determining the transient stability of a transmission line. Even a small disturbance can cause instability, however, particularly if it is repetitive and at the same frequency as the natural period of machine rotor oscillation, usually something of the order of a few cycles a second. The behaviour of the system after fault conditions is far more important.

Naturally the shorter the duration of the fault the less the shock to the system and the higher the load which can be transmitted. Thus circuit-breakers and protective gear systems have been developed which have an overall operating time from four to eight cycles. This fast switching time can only be used for a double circuit line with intermediate switching stations, so that the whole line is not lost after a fault. For such an arrangement a series of swing curves may be obtained to give a critical switching time curve as shown in Fig. 10. This curve enables an economic comparison to be made between power transmitted and circuit-breaker operating times.

To raise the whole curve, or to make the system more stable, the effective impedance of the system may be reduced, either by reducing the generator and transformer impedances, or by inserting series capacitors in the line to reduce its impedance. The inertia of the sending end machines may also be increased within narrow limits to increase the stability. For single circuit transmission line schemes, fast switching has to be accompanied by automatic reclosing if transmission is to be maintained at all after a fault. A dead-time of about 12 cycles has to be allowed before reclosing to clear the ionised air from the fault path, and this is a long time in which to allow the sending end machines to accelerate. It is, therefore, profitable in such schemes to apply a braking resistor to the alternators to retard or reduce their acceleration during the fault clearance and reclosing time. The mechanism of the circuit-breaker controlling the braking resistor is

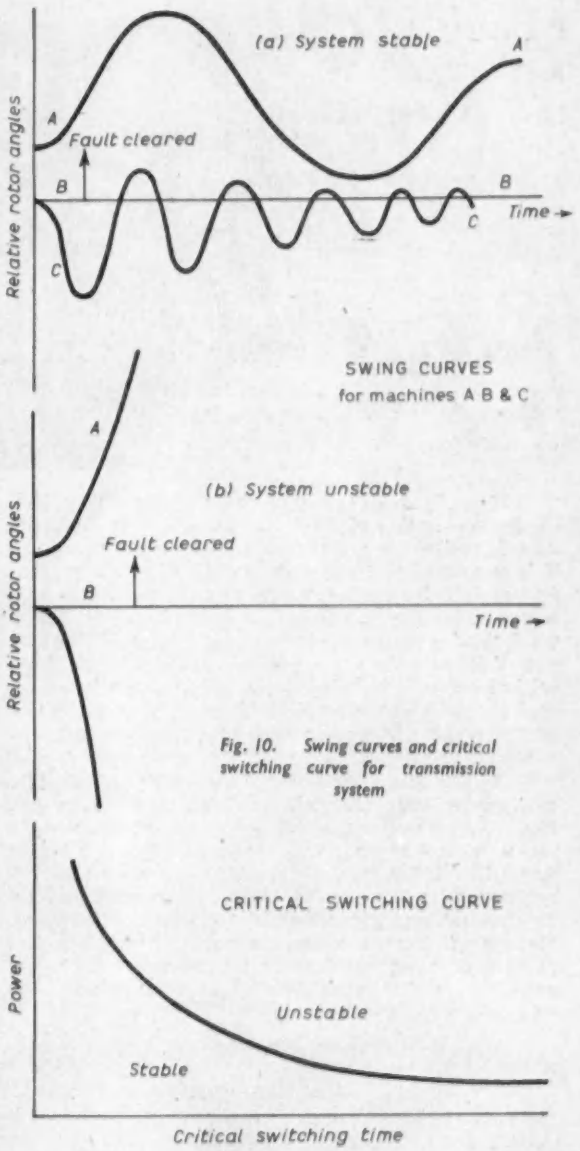


Fig. 10. Swing curves and critical switching curve for transmission system

designed for a close-open operation so that the resistor is "on" for a given number of cycles. This interval must be long enough to maintain stability on the most severe fault without causing instability on those less severe.

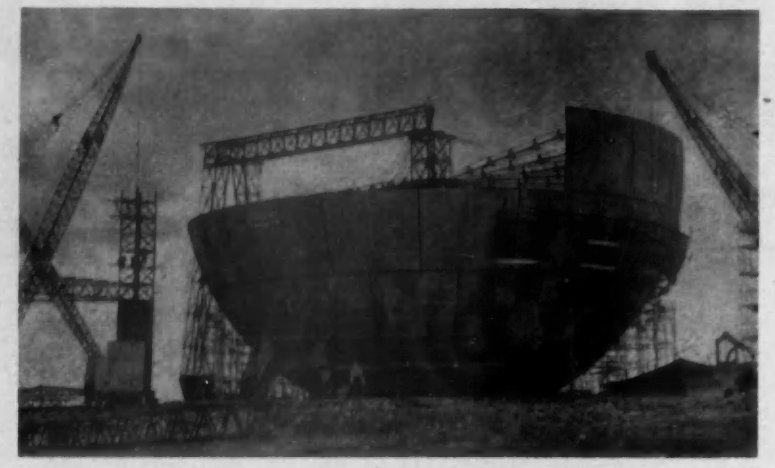
All proposals for the transmission of power have to be economically as well as technically feasible and a complete analysis on both sides is essential if the best use is to be made of available resources. Even from the technical side there is a tremendous variety in power transmission requirements throughout the world, which need to be satisfied for the benefit of all mankind.

Safety with Chemicals

WORK involving chemicals is likely to introduce special hazards. In laboratories where there is much work of this nature it is advisable to have a set of safety rules well known to all staff. Valuable suggestions in this direction are made in a new publication of the D.S.I.R., "Safety Measures in Chemical Laboratories," which is available from H.M.S.O., price 1s. 6d.

PROGRESS IN BRITAIN'S NUCLEAR PROGRAMME

A.E.A.'s 1st Year



The illustration shows the 135 ft diameter shell which will surround the Dounreay reactor under construction

DESPITE rumours to the contrary, the Calder Hall power station of the U.K. Atomic Energy Authority is unlikely to be generating electricity before 1957. This was stated by Sir Christopher Hinton at a press conference held in London last week to introduce the first report of the A.E.A. The report covers the period from the formation of the Authority on 19th July, 1954, to the end of its financial year, 31st March, 1955. Not all the original report is included in the published version. The chairman of the Authority, Sir Edwin Plowden, revealed that an annex dealing with supplies of uranium had been withheld from publication on security grounds.

Work within the Authority is divided into three main sections, research, production and weapon development. The weapons section, naturally, has little attention in the report, the one paragraph concerned noting that the Authority fulfilled the Government's directives in this field, and that these included the decision to proceed with the development and production of thermonuclear weapons. However, it has to be remembered that much nuclear research does not depend on ultimate applications, so the power production work benefits to some extent from weapon-inspired investigations.

Reactors

For the electricity supply industry, the main interest of the report is its comments on reactor development. The outstanding announcement here concerns the advancing status of work on light water-moderated reactors. A design study is being made on a reactor using light water for both moderating the nuclear reaction, and conducting away the useful heat. The project bears the name LEO (Low enrichment, ordinary water). The report states that the main technological question involved in this development is production of a suitable sheathing for the uranium fuel elements. It is necessary to find a sheathing material which will successfully withstand the corrosion attack of water. Stainless steel and zirconium are obvious answers, but both have serious disadvantages. The report states that other alloys are promising.

It has been decided tentatively that it will be best to generate saturated steam using the reactor heat, and then superheat this steam in a separate unit fired by conventional fuels. It is hoped that thermal efficiencies approaching those of modern coal-fired power stations can be obtained. The LEO study involves Babcock and Wilcox, and the English Electric Company. A representative of the C.E.A. has been acting as consultant.

Among other new types of reactor being studied are the homogeneous reactor in which fuel in a suspension or a solution is used, and the liquid metal slurry system, in which the fissile material is dissolved or carried as particles in a liquid metal. Both methods have some advantages over the use of fissile material in the form of fuel particles.

In spite of these developments, there is apparent on the part of Sir Christopher Hinton considerable faith in the future of the relatively simple gas-cooled graphite-moderated natural uranium reactor, of the type being built at Calder Hall, and which is to be used in modified form in the first C.E.A. owned stations. He stated at the conference that it seemed possible that the C.E.A. stations now being designed by industrial firms may prove to be more economical in the generation of electricity than had been suggested in the White Paper on the Government's nuclear power programme.

The report emphasises the close collaboration existing between the A.E.A. and the three electricity authorities on the nuclear programme. The A.E.A. is responsible for giving technical advice, and it will also supply and process the nuclear fuel. In this connection the report records the opinion that the supply position will become easier over the next decade.

Staff

As a new organisation, the Authority is experiencing difficulty in recruiting staff of senior status, such as it may expect eventually to train from its own employees. It is stated that in the industrial group of the Authority particularly, over the 18 months preceding the report, there has been difficulty about recruiting staff at all levels. Numbers have done little more than make up wastage. Speaking on this difficulty, Sir Christopher Hinton made it clear that the shortage was not confined to nuclear specialists. It extended to senior design engineers in all the technologies connected with nuclear reactor design and operation. Staff, it appears, rather than money, is the factor limiting the Authority's rate of progress.

The A.E.A. differs from all other nationalised corporations in depending for funds on money voted by Parliament. This is allocated under a number of headings, and savings under one heading cannot be spent elsewhere without Treasury consent. Receipts of the Authority, such as those coming from its radio-isotope sales, are applied as the Treasury directs. At present the net sum being spent, not including weapons work, is about £50m per year.

Diesel Power in North Borneo

PLANT AT JESSELTON HAS THREE 600 kVA SETS

THE new power station at Jesselton—the capital of North Borneo—has been on commercial load for several months. The power station is situated off Racecourse Road, about two and half miles from the town. The building is 94 ft 6 in. long by 49 ft 6 in. wide and consists of a steel frame structure carrying a five-ton overhead hand-operated crane which traverses the entire building. On one side of the station is a switchboard platform raised 4 ft above the general floor level of the engine room. Foundations for the building are carried on timber piles over which are laid reinforced concrete footings while roof and side walls are of corrugated asbestos. The foundations for the main engines consist of timber piles and each main engine is carried on a reinforced concrete foundation block.

Generating plant consists of three English Electric 8SRK diesel engines coupled to 600 kVA alternators. The diesel engines are eight cylinder units each having a bore and stroke of 10 in. and 12 in. respectively. They are capable of developing normal output of 744 b.h.p. when operating at 600 r.p.m. However, owing to site conditions, output has been derated to 715 b.h.p. Each engine is supercharged by a Napier turbo-blower.

Cooling

On the adjacent hillside, well above the level of the main power station, is a natural-draught open-type wooden cooling tower, and water is drawn from the sump of the tower by two Worthington Simpson/English Electric Monobloc pumping sets, each capable of delivering 1,000 gallons of water per hour against a 90 ft head. All pipes in the cooling system are protected externally with bituminous as well as hessian wrapping to guard against any high acid or alkaline content in the ground. Each non-flanged joint of the piping is connected by Johnson type couplings which permit axial flexibility.

After passing through the engine jackets part of the cooling water is diverted via Serck lubricating oil coolers, adjoining each engine. Each of these can cool 4,500 gallons of lubricating oil per hour from 137° F to 127° F, when 5,400 gallons per hour of fresh water at 95° F are circulating.

Electrical Equipment

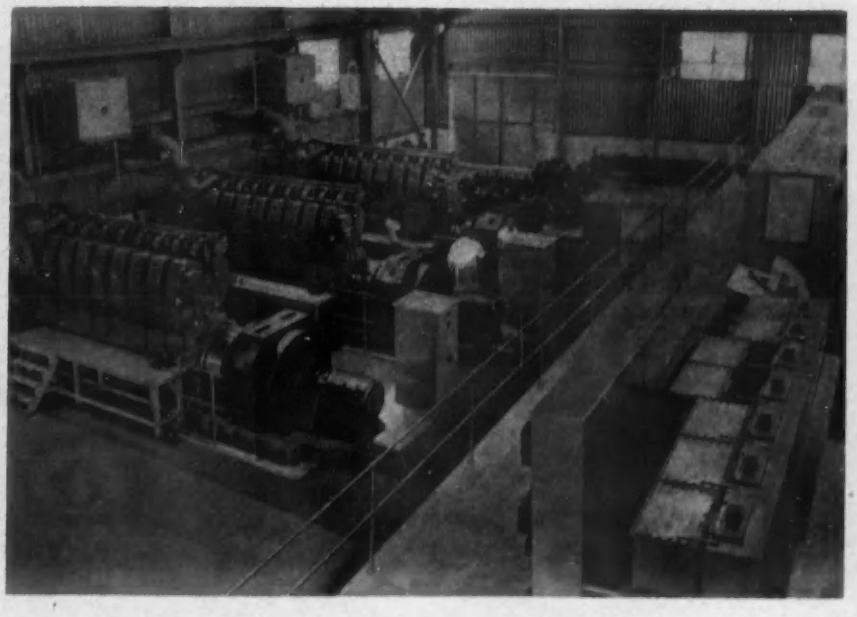
The alternators and exciters, of English Electric manufacture, are of the salient pole type, each having a single pedestal bearing at the non-driving end, and provision for the overhung exciter. The machines have an output of 600 kVA at 400 V, three-phase, 50 cycles. To ensure a twenty-four hour supply of light and power to consumers, the sets are run in rotation, normally twelve hours on and twenty-four hours off for each unit.

Switchgear consists of high tension and low tension panels, distribution boards, field suppression cubicles and switch tripping equipment.

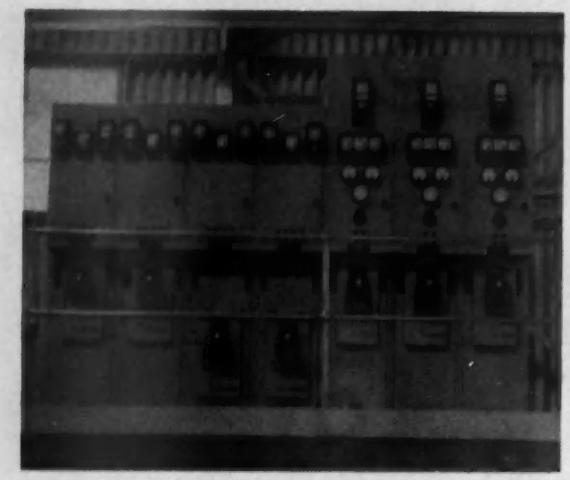
The alternator control board consists of an eleven panel English Electric type OB3 air circuit-breaker switchboard. This switchgear, which has a rupturing capacity of 25 MVA at 400 V to B.S.116, has air-insulated, manually-operated circuit-breakers, complete with hinged isolation, interlocked with the doors of the cubicle to ensure that the doors cannot be opened until the circuit-breaker has been isolated, thus ensuring the safety of the operator.

The board is made up of three alternator, three exciter and four transformer panels with a station auxiliary panel. Each alternator has metering and protective equipment incorporated in its respective panel. Protection consists of Merz Price reverse current and back-up protection which covers both overcurrent and earth faults in the alternators and also prevents the alternators from motoring the diesel engines should a fault occur on the prime movers. Each transformer panel has overcurrent and earth fault protection while the station auxiliary panel has direct acting overcurrent coils.

A synchronising panel is mounted on the left-hand side of the switchboard and can swing through 90° so that it can easily be seen at any position of the switchboard. The station auxiliary panel feeds an English Electric combined fuse switchboard for controlling the station auxiliaries. Beside each alternator there is a field suppression cubicle



Three English Electric 8SRK—715 h.p. diesel engines coupled to 600 kVA alternators in Jesselton Power Station



Type OLP high-tension switchgear panel in the station

which incorporates an air-break E.E. OB2 circuit-breaker. This is hand-operated and has a shunt trip wire which operates automatically in the event of an alternator fault, thus limiting the induced voltage in the alternator.

The 6·6 kV Distribution Board

The 6,600 V switchboard is a seven-panel English Electric type OLX hand-operated oil circuit-breaker switchboard having a rupturing capacity of 150 MVA at 6·6 kV to B.S.116. This type of gear has air-insulated busbars, vertical isolation and horizontal withdrawal of the circuit-breaker truck, which facilitates maintenance. All moving parts are interlocked for safety purposes.

The board is made up of four incoming transformer panels and three outgoing feeder panels. The transformer protection consists of a Buchholz device, directional over-current relay, together with restricted earth leakage protection. This type of protection provides discrimination should a fault occur in any transformer operating in parallel. Intertripping with the low tension circuit-breakers is arranged so that both circuit-breakers trip open if a transformer fault occurs.

The feeder distribution panel has unrestricted over-current and earth leakage protection. Provision has been allowed on all switchboards for future extensions.

Transformers

Four transformers, also by English Electric, have been supplied, three rated at 600 kVA and one at 150 kVA. Each transformer is a type ON outdoor, ground-mounting type, 400/6,600 V at no-load, delta-star connected, and as mentioned is supplied with Buchholz relays to operate gas alarms, etc. Each transformer is earthed via neutral switch on the 6,600 V side, and has a current transformer mounted over the earth cable for restricted earth leakage protection.

An interesting feature of the station is that the diesel-alternator sets are accurately aligned and bolted to specially fabricated steel underbeds which are in turn bolted to the foundation blocks. Under these circumstances it is practicable for the complete generating plant—should such a necessity arise—to be rapidly and easily removed from the station after disconnection of the normal service pipework and cabling.

The equipment for the station was supplied through the Crown Agents for Overseas Governments and Administration to the Public Works Department of North Borneo. The first year of operation was successfully completed at the end of October last.

Sensitive Infra-Red Detection

TEMPERATURE control and measurement is of vital importance in the steel-making and processing industry. A new lead sulphide photo-conductive cell, developed by the British Thomson-Houston Co., may, however, have applications in other industrial fields. The equipment is operated by the invisible infra-red radiation from a hot body, even at black heat and has a built-in relay capable of controlling an external electric circuit carrying up to 1 amp at 440 V a.c. Unlike the more usual photo-electric equipment, no external light source is necessary.

As the apparatus was originally designed for steel-works use it was essential that it should be of extremely robust construction and two equipments are now available for use under the most arduous conditions. One of these, the Model IR2 is capable of detecting a body 4 ft away at 400° C, and a more sensitive model, the IR3, will detect a hot plate at 80° C under ideal conditions at the same distance.

The IR2 equipment consists of two units, the electronic circuit components and the P.O. relay, which are housed in a small die-cast box, and the detecting head incorporating the sensitive cell. It is essential to keep the cell reasonably cool for efficient operation and to maintain it at a sufficiently low temperature (about 60° C) and to this end it is fitted in a specially-designed water-cooling housing. Thus adequate cooling may be obtained even when the head has to be mounted in close proximity to very hot bodies such as white-hot billets of steel.

The Model IR3 equipment is also made up of two units, although in this case the electronic equipment is housed in two die-cast boxes of similar design mounted as one. The water-cooled head also differs in that a motor-driven slotted disc is incorporated to interrupt the radiation falling on the cell and thus feeds an a.c. signal to the amplifier. Both the models possess the requirements of high speed of response and great sensitivity.

Water-cooled detector head for the model IR2 infra-red relay

READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

Electric Thermal Storage Heating

WITH further reference to the above, it is sometimes necessary to provide a heating installation in a building consisting of a number of rooms or offices which have different requirements. My experience shows that such a situation can be met as follows:

Throughout the building let there be a background of heaters, time switch controlled, which are given a full charge each night. In addition to this, in the individual rooms, install other heaters with local thermostatic control, e.g. an office may need four heaters, let two of them receive a full charge each night, the other two with local thermostatic control will vary their demand and output according to the changing conditions of the season and the individual local requirements.

Where a number of people occupy different rooms in one building, their requirements can vary by as much as 10° F and I find this method is one way of dealing with a situation that otherwise could be difficult.

L. Houldridge,
ELDON, NR. PETERBOROUGH.

Wiring Regulations

HAVING read with interest Mr R. W. Marsh's comments, re my letter in Readers' Views (your issue of 13 Oct.) on I.E.E. Statutory Regulations, I cannot quite agree with Mr Marsh's statement that the 13th Edition of the I.E.E. Regulations does not give the Electricity Supply Authority any more power.

Part I—Requirements for Safety, is certainly written with Electricity Supply Regulations 1937 in mind, and therefore Part I is a *must.*

Para. 5 of the Introduction of the 13th Edition certainly states: "Failure to comply in a consumer's installation in Gt. Britain with the requirements of Part I would place the undertakers in the position of not being compelled to connect or, in certain circumstances to continue to give a supply of energy to that consumer."

According to the above, I fail to see Mr Marsh's point that the Area Boards don't have the necessary power to have the installations altered to comply with the I.E.E. Regulations.

A. Dearden.
MANCHESTER.

Winter and the Domestic Heat Pump

THE heat pump has always appeared as a most attractive proposition and it was, therefore, interesting to read Mr Basil de Ferranti's account of some operating experiences. The scheme sounds so much like something for nothing, hot water for the price of refrigeration, that one inevitably tends to look closely into the origin of the heat. When operating normally the heat supplied to the water comes from the refrigerated pantry but tracing its origin beyond that point it is clear that it is the heat passing through the pantry walls and door (excluding the heat originally in the foods placed in the pantry). Most pantries are constructed on one or two external walls which may be of brick, the internal walls being of breeze. I have been unable to find the relative rate of thermal transmission of these two classes of materials but a significant factor is the different thermal gradients which exist between internal and external walls in winter time. With an average outdoor winter temperature of 40° to 44° F there can be little flow of heat through the external walls. On the other hand the thermal difference across the internal walls will be some 20° to 25° F higher. It would seem, therefore, that in winter the heat leaking into the pantry is likely to come from inside the house. Have we not then reached the stage whereby we are expending fuel, of whatever kind, to heat the inside of the house and it is this heat that eventually finds its way into the hot water tank. I have seen no mention of the need for lagging the inside walls of the pantry and if this were done then on the occasions when the outside temperature is at the same level as the refrigerated pantry no hot water would be provided by the heat pump. I would greatly appreciate an elucidation of this anomaly whereby it is high grade and not low grade heat that is indirectly used for heating the water and whether full attention to this consideration is given in the installation of heat pumps of the type described.

"Prometheus."
HIGHGATE.

Engineers and the Factory

IN the section "Sayings of the Week" in your current (3rd November) issue, I see you are quoting a certain Mr D. A. Neill as having said the following: "Many qualified engineers think that going on to the factory floor to help sort out production problems is beneath their dignity."

Such a statement as this must not go unchallenged. As a university-trained chartered electrical engineer I feel Mr D. A. Neill should be made aware of certain facts which not only answer his criticism but partially explain the shortage of engineers, draughtsmen and others in this country today.

I now have 10 years' post-graduate industrial experience spent in the electrical manufacturing industry—approximately 8 years with one manufacturer and nearly 2 years with my present employers, both of these companies being in the "small-to-medium" category. With my first employers, engineers, designers and draughtsmen were deliberately encouraged by the management to take an active interest in the products on the shop floor and I can assure Mr Neill that every possible opportunity was taken by the engineers, etc., to see, criticise and advise on the shop methods adopted.

While we often groused about the management we were at least a team working in harmony with each other, and I can recall many fruitful arguments I had with works personnel from the manager downwards.

What a contrast with my present employers. Here the engineers are *discouraged* from entering the workshops while they are actually in operation unless specifically asked to clear up a point (usually a mistake) by the foreman in charge. In fact discouragement is too mild a word to use! ! It is literally true to say that a designer could work here till he retired and never see the fruits of his labour in the form of the completed product.

It is interesting to hear the management's reasons for this discouragement. They are (1) there is a "Methods and Time Study Department" and (2) the people in the works would not stand for any interference and the risk of strikes would be increased.

Liaison between "Methods" and the design office is practically non-existent, and to the second reason one can only reply "tommy-rot."

I am assured by friends that this isolation of engineering and design staff is quite usual and surely here is one reason for the shortage of engineers and draughtsmen. We all know that the differential between the wages of skilled shop operatives and design office personnel is slowly disappearing but this, I believe, is a minor point to the engineer of the right calibre, but he, nevertheless, expects to enjoy certain conditions in his employment of sufficient attractiveness and surely one of these is the enjoyment of a certain minimum status level which he often is just not getting. This is particularly true of those firms who believe that an engineer and designer can do his work efficiently by just setting down at a desk and churning out designs as a human sausage machine.

No, I think Mr. Neill would have done a much better service to industry by directing his remarks to those managements who appear to have no idea at all on the correct way to get the best out of the qualified engineers he maligns and others in their employment.

I can assure Mr Neill that I would gladly change my job to one where I was expected to go on to the factory floor to help sort out production problems.

"Chairborne,"
MIDDLESEX.

Pressure Piling in F.L.P. Equipment

ELECTRICAL aspects of safety in mines are prominent in the 33rd annual report of the Safety in Mines Research Establishment, which was published last week and which deals with work during 1954. One of the important subjects under current investigation is the phenomenon of "pressure piling." This refers to the effect whereby, when a gas mixture is ignited in one of two interconnected compartments, abnormally high pressures may be developed in the other compartment.

The geometry of the duct connecting the two compartments seems likely to affect the pressure rise. A duct which is very narrow will allow only a little gas to pass ahead of the igniting flame into the second compartment, while one which is very wide will turn the two virtually into one compartment, with no pressure piling possible. Thus some intermediate size would seem most likely to give the maximum effect. In some tests made with a 3% pentane in air mixture, varying duct dimensions, maximum pressure piling was found with a duct 0·375 in. diameter. Variations in length from 2·5 to 15 in. seemed to make no difference to the maximum pressure developed. Recent work on a large core-cooled electric motor has suggested that slightly richer mixtures of pentane and air may give rise to considerably more violent explosions in the remote chamber.

A further investigation into the effect is being undertaken by the E.R.A. using the casing of an 800 h.p. core-cooled motor specially fitted with a dummy stator and rotor which can be modified to represent different designs.

Flameproof Enclosures

Investigations into flameproof enclosures continued during the period covered by the report. Particular attention was given to town's gas.

It has been found that the flanges of certain flameproof casings may be bent by the internal explosion, so that they exceed safe dimensions by the time the flame reaches them. This is taken care of in British practice by the type tests conducted on each item of flameproof equipment before certification. It does, however, slightly reduce the factor of safety offered by a given design. Apparatus for use with Group IV gases is likely to be most affected.

The possibility of using polymethyl methacryalate (Perspex) as a substitute for glass in flameproof fittings is mentioned in the report. This development is held up while a suitable cement for sealing joints between metal and methacryalate surfaces is chosen. Cements permissible for glass to metal joints are not suitable.

During 1954, the testing services of the establishment dealt with 140 new applications for flameproof certification. 124 units were tested, and of these five failed. There was one case of pressure piling in a tubular fluorescent fitting which caused the glass protecting the tube to break, and another case of pressure piling in a core-cooled motor which resulted in cracking of the cast iron end cover. In addition to the failures, there were several other examples of the development of abnormal pressures due to pressure piling. It is noted that even though there are not two well defined chambers, pressure piling may occur where there is a long interconnecting channel. This was found in tests on a range of tubular space heaters, some of which were 9 ft and 16 ft long.

Amongst many other matters of interest discussed in the report is the effect of hydrogen emission or the possibility of using alkaline batteries for mine haulage locomotives. Immediately after charging, alkaline cells were found to emit hydrogen at a far higher rate than the lead-acid cells which at present are alone permitted for this duty. In normal use after standing for at least two hours, however, they evolved hydrogen less slowly. No evidence was found in this investigation of the appearance of pyrophoric iron in alkaline cells.

Incendive Sparks

Some limitation is placed on the metals used for the casing of mining equipment because of the risk that incendive sparks will be generated when the metal is struck by a rusty iron implement. This is particularly likely to occur with alloys containing a high proportion of magnesium or aluminium. Thus the use of these light alloys is restricted. Experimental work on aluminium-zinc alloys has shown a risk of incendive sparking down to quite small proportions of aluminium.

Ignition of inflammable gases with electric sparks has also been under investigation. The object of the investigation has been partly to test the often-made statement that any spark liberating more than a certain critical energy can ignite a certain gas mixture. Measurements of the energy of sparks caused by breaking the minimum igniting current in various types of circuits have shown that there is no simple relationship between the igniting energy and the current. However, the mean power of a spark just capable of causing ignition has been found to increase linearly with the current in a series inductive circuit.

It has been found in the course of this work that chemical cleaning of the platinum electrodes of a spark gap reduced the incendivity of a spark from a given circuit. This may have some importance in the testing for certification of intrinsically safe apparatus.

Annoying waiting is avoided when the customer helps himself

Self-Service Wholesaling

SALES GETTING IDEA EMBODIED IN NEW CORNISH DEPOT SPEEDS UP DISTRIBUTION

PHENOMENON of post war years is the growth in Britain of self-service stores, particularly in the grocery and food trades, designed to overcome a shortage of sales staff and to speed up the process of domestic shopping.

Now the idea has spread to the wholesale trade—our own electrical wholesaling industry, in fact, as a result of a unique venture by the Sloan Electrical Company.

Their new depot at Truro, which was opened by Mr O. H. Buckingham, Director of Hotpoint Electric Appliance Co., Ltd., on Tuesday this week has been designed exactly on the lines of the retail self-service store but instead of helping the consumer to save time, it provides retail type service to the retailer himself and incidentally helps him to avoid the necessity of keeping large stocks on his own premises.

"Off the shelf service" has been the slogan of the company for many years—they have been in business for 56 years and all the time they have devoted their attention to improving the service they offer their friends in the trade. For the past two years some Sloan branches, which were suitably constructed, have been operated without the traditional "Trade counter" regarded by the company as a barrier between the customer who has come to buy and the goods they wanted to sell. These branches had a small display room with rows of bins running back from it so that a natural progression of the customer was from the display to the store area, in which he was invited to walk around.

This, Sloan's decided, wasn't enough! They must give their customers better service, they must avoid wasting his time if temporary surges of business made him wait for attention, so they hit on the idea of "self-service electrical wholesaling"! Having accepted the idea, their first problem was how to index the goods in the bins so that the customer could quickly find the article. For even in self-service retail shops this problem was often apparent and, as wholesalers, the company carries a much larger range of products than the average retail store.

To the company their catalogue seemed to be a natural index so the new stores have been organised in catalogue order. If a customer is provided with a catalogue then directed to "Lampholders" (first item in the publication) he should be able to trace all other items without much difficulty. The bins are labelled clearly and there are always members of the sales staff at hand to assist the customer, or serve him in the conventional way if he so prefers.

The manner of self-service follows closely the relevant retail practice except that many of the commodities are bulky or heavy. On the ground floor the customer is provided with a trolley on entering the store. Having obtained his requirements he takes them to the invoicing desk when the goods are booked out in the usual way and transferred to the customer's transport. On the upper floors goods are transferred by lift to the ground floor desk.

Having taken from the bins the goods he requires, the dealer then wheels his trolley to the invoicing desk on the ground floor

Appliances are displayed for the benefit of the retailers' customers as well as for the dealer himself

After invoicing, the goods are despatched via the dealer's or the Company's own transport

If, on the other hand, the customer prefers to have the goods delivered he is given an order pad on which he notes quantities and description (usually the catalogue number suffices) and the goods are despatched.

Entrance to the stores is via the showroom where lighting fittings and various appliances are displayed not only to interest the contractor retailer but also to help his customers who may use the conventional introductory vouchers with which the retailer is supplied. First display in the stores is on counters which carry spare parts and heating elements (over 300 different fire types in two voltages and nearly 100 different iron, toaster and kettle elements) with the bulk stock stored under this display counter. In this way a dealer in search of an unusual replacement element or part can match up the replacement from the stock displayed—yet a further example of the firm's endeavour to assist their retailer friends!

When staff of the Sloan Electrical Co. receive their monthly bonus the dividend schedule accompanying it states: "This packet comes to you by the goodwill of your customer, see that you serve him well." Their new walk round store at Truro is an extension of this principle.

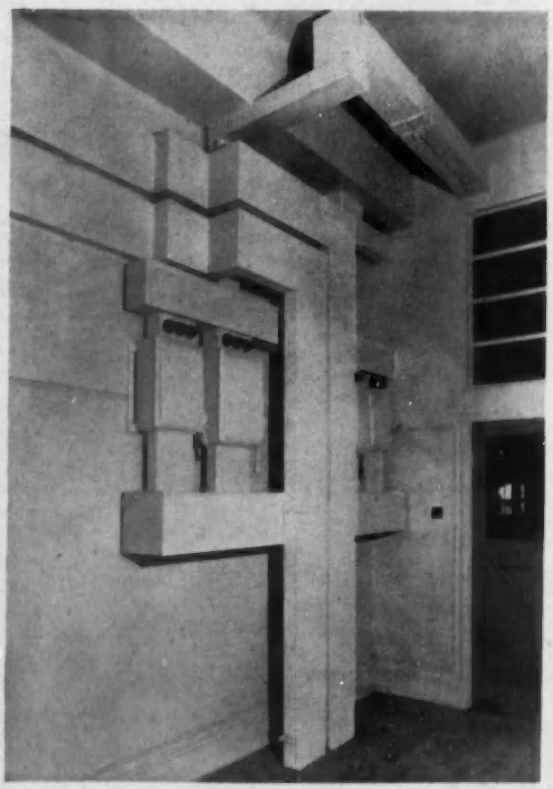
NEW COLLEGE USES BUSBAR TRUNKING

THE use of busbar trunking in the new Birmingham College of Technology at Gosta Green, inaugurated last week by Her Majesty The Queen, evinces the increasing popularity of this system for planned electricity distribution.

To supply electricity for lighting and power throughout all nine floors of the new college, the Midlands Electricity Board have installed a complete vertical rising main busbar trunking distribution system. The equipment for the installation supplied by the General Electric Co., Ltd., covers four vertical rising mains, two in each wing of the college, feeding horizontal busbar trunking on each floor through associated switchgear. Carried through the main corridors above a false ceiling, the horizontal trunking has provision made for tapping off to various services.

Divided equally for lighting and power, the rising mains have capacities of 300 amps and 400 amps per phase respectively. In each wing of the building, the rising mains consisting of one lighting and one power riser, are arranged side by side, fed by mains cable at the lower ground floor and terminate on the sixth floor. The conductors in each riser are four solid sections of copper busbar carried on porcelain insulators and enclosed in heavy sheet steel casing.

At each floor level, the busbars pass through fire-resisting barriers and distribution for each floor is effected by units superimposed on the vertical risers containing 100 amp and 200 amp fused switches with pilot lights for lighting and power. External copper links on each length of trunking maintain earth continuity and altogether, the complete system required a total of nearly 9,000 ft of busbar trunking.



Part of the distribution system in the new Birmingham College, showing the riser and the 100 amp and 200 amp fused switches with pilot lights

NEW TRANSMITTING FACILITIES AT RUGBY

I.E.E. Meeting hears details of the Radio-telephone and Telegraph Station

RUGBY became well known, soon after its opening in 1926 for its world-wide transmissions on the low frequency of 16 kc/s. In the same year a further transmitter was installed operating at 60 kc/s and with a power of 50 kW. This was opened in 1927 for the first public long-distance radio-telephone service (London—New York). The spectacular success, however, of high frequencies for long-distance radio communications led, in the same year, to the introduction of h.f. transmitters. By 1955, progress had been such that the station contained 18 h.f. transmitters, most of which were used for independent sideband (i.s.b.) operation and could provide up to four channels per transmitter. In addition, four transmitters had been installed for standard frequency transmissions and one for telegraph working. A new station was, however, required to handle future demands, and a description of this was given last Thursday to an Ordinary Meeting of the I.E.E. The paper was entitled "The New High-Frequency Transmitting Station at Rugby" and was presented by Capt C. F. Booth, of the Post Office Engineering Department, and Mr MacLarty, of Marconi's Wireless Telegraph Co.

The station is located adjacent to the original Rugby station on a 700 acre site and has been designed to accommodate 28 h.f. transmitters with upwards of 70 aerials. The traffic requirements are complex. For telephone operation the merits of the i.s.b. system are so outstanding that it has been standardised by the Post Office, and therefore adopted for the telephone transmitters. In the telegraph services the position was not so clear. A variety of systems, both single- and multi-channel, was being used for public traffic and, in addition, important multi-destination Press services were being operated on various different single channel systems.

Despite wide variety of requirements it was considered essential to standardise as much as possible of the transmitting equipment. By dividing the transmitter into two parts, a low-power drive unit and a high-power transmitter-amplifier it has been found possible to make the latter—the larger and more costly part of the transmitter—suitable for all the various classes of service. The output of the transmitters on telephony is 30 kW and on telegraphy is 20 kW.

Power is taken from the old station from the 11 kV mains or from an emergency supply and is transferred via two well spaced underground cables, each of which is capable of supplying the load of about 1,400 kVA. These feeders supply two interconnected substations behind the transmitter building. Protection is by a balanced current feeder-protection system whereby the system is divided into overlapping zones. Each substation contains three 500 kVA transformers, two working and one spare, for supplying the medium-voltage system. The transmitters are supplied in groups from two m.v. switchboards in the transmitter wings but since the grid-controlled mercury arc rectifiers will clear overloads faster than any circuit-breaker, the m.v. protection is limited to h.r.c. fuses.

DISCUSSION

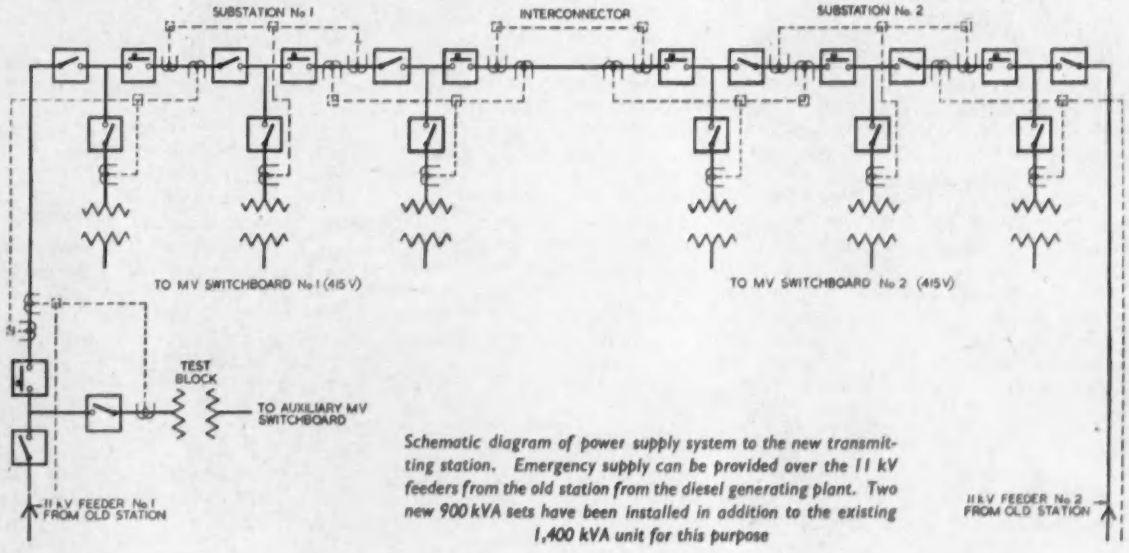
MR H. STANESBY (G.P.O.) said the paper described the biggest h.f. station ever to be built as a single project, and one which pointed the way to the future in high efficiency, cleanness of the design, economy in man-power and reduction in effective transmitter time. Frequency stability was a good deal higher than was called for by international regulations, and the spurious emission just outside the transmission band was very low indeed.

MR H. FAULKNER (T.E.M.A.) congratulated the designers on using air cooling for the transmitters; it had proved effective, and the noise was low.

MR J. A. SMALE (Cable and Wireless), while admitting that standardization of transmitting equipment gave operational advantages, questioned whether economic advantages could be claimed for it. From the figures given for feeder attenuation, and taking into account the unfortunate use of aerials such as rhombics, whereby a further third of the power "went down the drain," there seemed to be an efficiency of about 50%.

COLONEL D. MCMILLAN (Post Office), speaking from the point of view of the user of the station, said that their experience to date convinced them that all they had hoped for from the design of the station, was in fact being achieved by it.

MR A. COOK (Post Office) dealt with the economic calculations which had been made in designing the new station, and Mr A. N. Thomas (B.B.C.) and Mr W. J. Morcom (Marconi's) also took part in the discussion, to which Mr B. N. MacLarty replied.


SUBSTATION No 1
INTERCONNECTOR
SUBSTATION No 2
TO M.V SWITCHBOARD No 1 (415 V)
TO M.V SWITCHBOARD No 2 (415V)
TEST BLOCK
TO AUXILIARY M.V SWITCHBOARD
11 kV FEEDER No 1 FROM OLD STATION
11kV FEEDER No 2 FROM OLD STATION

Schematic diagram of power supply system to the new transmitting station. Emergency supply can be provided over the 11 kV feeders from the old station from the diesel generating plant. Two new 900 kVA sets have been installed in addition to the existing 1,400 kVA unit for this purpose

FAULT RECORDING

Instrumentation required on a power network discussed by I.E.E. Measurement Section

WITH supply continuity a criterion of modern power system operation, it becomes essential to obtain full information of all disturbances which occur on the system. Although part of this information is required quickly to enable the operating staff to take appropriate action, arrangements have also to be made to enable the remainder, which is equally important, to be stored to await a convenient time for its collection. Both types of information, and the quantities involved, present considerable instrumentation difficulties to which no comprehensive solution has been found, but a useful insight into modern practice was provided by discussion last week by the I.E.E. Measurement and Control Section.

In their introduction, W. Casson, M.I.E.E., and L. C. Suros, A.M.I.E.E., pointed out the need to provide not only indication of protective and switchgear, and alarm system operation during the disturbance, but also information of currents and voltages at different parts of the system before, during and after the disturbance to enable the cause of the disturbance to be deduced. It is also desirable to obtain records of any changes occurring during the disturbance.

Quantities to be measured

Quantities which can be measured include phase currents, residual and neutral currents, and phase to phase, phase to neutral and residual voltages, whilst information on load and kVAr flow conditions may also be important when determining the performance of directional relays. Moreover, the possibility that the magnitude of a current on fault may be 30 times that under load introduces a further problem when accurate instrumentation is required under all conditions. A clear distinction must be made between recordings of short duration transients, lasting only a few microsecs, and power frequency quantities, whilst the timing of operation of circuit-breakers and protective gear may also be desirable.

Fault-recording instruments fall into two main groups, the former comprising those which record only the maximum value of the changing quantities concerned; loose pointer instruments, spark gaps, instruments using permanent magnetism, the klydonograph and the electronic surge voltage recorder are among those in this class. The information provided by these instruments can usefully be supplemented by counting devices measuring the number of cycles of fault current.

To the second group belong chart or oscillographic recording instruments. To obtain full benefit of oscillograph recording, system conditions immediately before a disturbance, as well as those occurring during and after it, should be recorded. This requires the instrument to incorporate a memory device, which may be effected electrically using a delay network, electro-chemically using a cathode ray tube with a persistent fluorescence or by other means involving continuous recording and erasing, the latter being stopped when a disturbance occurs. A particular application, using mechanical recording, of this principle is the Masson-type instrument, whilst magnetic recording applications are also employed. All recording instruments of the second type require a starting device which is actuated by the system disturbance. Choice of instruments will depend on maintenance facilities, collection of information and cost as the main factors.

In the ensuing discussion, to which fourteen speakers contributed, the development of a recorder with a magnetic drum memory system was described. Although using little power and imposing negligible burden on c.t.s. it was limited by a restricted frequency response even with h.f. bias. The cost of the memory features needed to secure a record of the first 0·05 sec of an occurrence was thought by one speaker to be disproportionate, and by another, justified, in view of the informative results obtained on the London supply network. It was felt desirable, however, that such equipment should be arranged to indicate negative phase sequence to which a later speaker replied that electronic apparatus for this purpose, in terms of voltage, was being developed.

A fault duration recorder imposing a small burden and presenting a constant impedance, based on a high-speed relay and two chronometers, was also described, its supporter pointing out that, given the time sequence of events, many values could be derived by a network analyser, thus obviating complex recording. Research apparatus was represented by a trailer-borne, automatic c.r.o. with photographic recording, this capable of resolving c.b. switching surges and similar transients up to frequencies of 100 kc/s. For the unattended monitoring of numerous feeders on an interconnected system, Masson-type istruments were considered advantageous, particularly with skilled interpretation of the record, and an improved model, in which the usual seven channels are now supplemented by twelve d.c. marker channels to facilitate study of c.b. and protective gear operation sequence, was described. Mention was also made of the American schemes of adapting radar techniques and radio-location of flash-overs.

Solar Decomposition of Water

ALTHOUGH the results of scientific research hold out many possibilities of directly converting the sun's energy for immediate use, none, so far, is within reach of realisation on a practical scale. One of the drawbacks to most of the schemes suggested has been the lack of adequate means of storing the energy released, but this difficulty now seems to have been overcome in the method put forward by Dr Heidt, of the Massachusetts Institute of Technology, at an international symposium on solar energy held last week at Phoenix, Arizona.

By this system, sunlight would be made to decompose water into its constituents, hydrogen and oxygen, the former then being stored for use as a fuel to power internal combustion engines. In this way, 2½ gallons of water would, it is estimated, provide energy equivalent to that contained in 1 gallon of petrol. This possibility of using solar energy results from experiments during the last few years in which ultra-violet light has been made to decompose water in the presence of suitable catalysts—ceric perchlorate and perchloric acid. Although the process is still a research project, it could acquire an economic importance when ways had been found to make it more efficient by utilising the whole of the sun's spectrum.

around the trade

by Peregrin

NOW and again in these notes, I enjoy a tilt at the "Do-it-yourself" addict, and although I still view him with disfavour, I am always willing to hear the other point of view. I was interested and surprised, therefore, when an electrical contractor friend expressed keen approval of the handyman—and handywoman. He declares he is always pleased to sell material for a wiring job, or parts for an appliance repair, for, not only does he charge what he likes and make a profit, but more often than not he is called in to finish the job. It seems that on Saturday he sends the amateur electrician happily away, loaded with all he needs, and perhaps a good deal more than he needs, and he is not at all surprised when a disgruntled wife calls in on Monday morning, begging my friend the expert to come and disentangle her husband's efforts, so that she can restore the house to the pleasant abode it was before the weekend. Sometimes the enterprise even ends in tragedy, and another skilled tradesman has to attend to repair the hole where the handyman put his foot through the ceiling.

It is the same story with appliances, so this retailer says. Iron elements, fire elements, motor brushes and such odds and ends, are sold with relish, in the knowledge that sooner or later the repair will find its way back to the electrical shop for satisfactory completion. I was about to ask my friend to teach me his technique, but happily a demonstration came my way. In came a man with ambition in the way of converting a landing light to 2-way control. The electrical contractor, barely restraining himself from rubbing his hands with glee, filled the counter with expensive material and recited explicit instructions, illustrated by a complicated diagram. By this time the man was plainly unsure of his competency, but my friend heartily reassured him—"Oh you'll manage it all right—but—if you *do* happen to get into difficulties just send for me and I'll soon put you right." I wished this subtle retailer goodbye, thinking that if he ever takes up theatricals the part of Iago in Othello would suit him very well.

Employee's Discount

One of the oldest quarrels in the electrical trade, and indeed in other trades, is now having a lively revival. Retailers in a certain town are taking strong objection to employees of a local factory being allowed discount on the firm's products. They are even considering reprisals in the shape of refusing to install appliances so purchased or to erect television aerials. This practice has been argued about ever since carbon lamps were used, and it always will be. The present revolt, however, is based on modern developments. The traders argue that while it is not unreasonable for an employee to obtain some concession from his employers, the privilege should apply only to goods made in his particular factory. In these days of huge combines, however, one concern can make everything electrical and radio in a group of widely-separated factories. Why, therefore, it is asked, should a man working at a factory which only makes castings or mouldings, be able to obtain trade terms on an article made at an associated factory a hundred miles away. Retailers also complain that there is no restriction on the scope of purchases. It is said that an employee can buy anything he likes, not only for his own needs but for all his friends and relations, making a tidy profit in the process. Such license is, of course, a serious abuse, and it is difficult to believe that manufacturers knowingly condone it.

But the point always ignored by manufacturers when they attempt to defend the custom, is that in allowing trade discount they are losing nothing at all, in fact, they stand to gain. They are merely giving away something that does not belong to them—the wholesaler's and retailer's discounts, while their own normal profit remains intact. If these sales to employees are as large as they are said to be, the manufacturers should be doing well out of the deal. Cash on the nail, no book-keeping to speak of, no monthly settlement discount, no tiresome wholesalers and retailers to deal with, and contented employees into the bargain. It should be remembered, however, than an article can only be sold once, whether direct to an employee or through recognised trade channels. The aggregate volume of sales is not increased by selling to employees. It would seem to be a sensible policy, therefore, to foster the goodwill of those who are in the trade to make a living, and, if the employees must have this concession, to direct them to retailers for their purchases, the manufacturers bearing the cost of the discount thus allowed.

Selling Sewing Machines

Whatever else we have to endure in this trade of ours, it certainly is not monotony. Visiting a retailer friend recently I noticed a sewing machine on show, and soon discovered that he not only shows them but sells them. Now my idea of a sewing machine is a shiny black object with knobs and wheels protruding all over it, a belt-driven motor attached and perhaps a light tacked on. This one was nothing like that. It was a smooth, grey, stream-lined beauty, with the motor and everything else concealed including the light. A joy to look at. It had variable speed control, and it was the "free-arm" type, which I understand means that sleeves and trouser legs can be threaded over the sewing base, instead of being laid on it.

Until recently the traditional sales method has been through a chain of shops sponsored by the makers, or through appointed agents. The newcomers, however, mostly foreign machines, are offered through the usual channels of wholesaler and retailer, so here is another opening for those who get in first and take their share.

One misgiving occurs to me. This particular dealer believes in taking his own medicine, and he has acquired an impressive familiarity with swing-needle stitching and two-colour effects, which mean nothing to me. How then will the less receptive and lazier type of dealer manage to give a convincing demonstration to a woman, always the most exacting and least gullible of customers.

Engineering Development in Western Germany

GERMANY'S success in regaining many of her markets is a common talking point. Part of that success stems from the effort made to build up the scientific organisations on which technical advances may be based. A new D.S.I.R. publication* gives a useful survey of what Western Germany has accomplished in this field, and the present article summarises what that document has to say about electrical engineering.

The major technical society in the electrical field remains the Verband Deutscher Elektrotechniker, e.V. (V.D.E.). It prefers the holdings of small special conferences rather than large annual meetings. From it has developed recently the Nachrichten Technische Gesellschaft (technical information society) located in Darmstadt. This will be concerned mainly with communication subjects.

Siemens Schuckert still dominates the development of heavy electrical equipment, according to the report. It has recently delivered two 150 MW turbo-alternators to West German power stations. Hydrogen cooling at 30 lb/sq in. and hollow conductors were used in these machines. A 190 MVA set is at present under construction. The A.E.G. of Berlin has recently installed a 35 MVA hydrogen cooled machine.

Another A.E.G. development has been the application of mercury-jet turbo-rectifiers and inverters for a number of purposes. The rectifiers have been used for starting aircraft engines, and the inverters initially to facilitate the installation of fluorescent lighting in the trains of the German Federal Railways. Further developments are in hand to satisfy the Railway's desire to install television sets in their touring trains. The A.E.G. operates a high tension laboratory at Kassel, which offers a fine range of facilities, including a weather room extensive enough to test the largest existing circuit-breakers over a range of -40° C to $+80^{\circ}$ C at any humidity and in rain. Another notable development in the research field is the building by Siemens und Halske of a nine-storey laboratory in Munich to deal with communications work. 1,200 people are now at work there.

Away from heavy engineering, there is interest in two new types of accumulator introduced by the Deutsche Edison Akkumulatoren Company. One of these is a gas-tight miniature design, suitable for portable receivers and deaf aids. It is claimed that the 12 watt-hours per kilogram capacity of more normal accumulators is almost doubled, and that volume requirements are reduced. The other type is of use when peak loading is the main consideration. It employs sintered plates, and can be recharged particularly quickly.

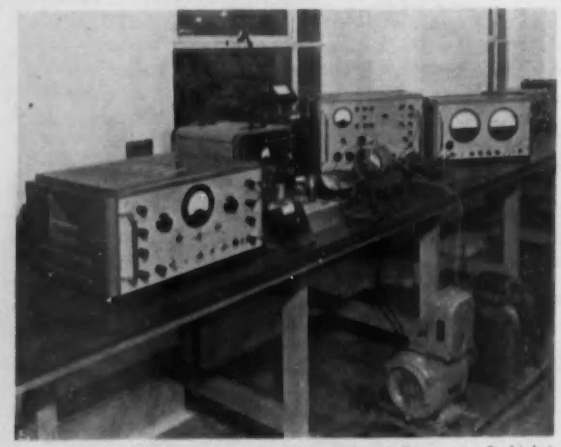
Electrostatic generation has been investigated at the University of Tubingen. One experimental machine uses two 11 cm diameter discs of insulating material rotating in opposite directions with only a very small gas layer between them. At 6,000 r.p.m. a current of 0·3 mA can be obtained at 28 kV, the required gas pressure being 5 atmospheres. Output per unit volume, 0·12 watt per cc, is claimed to be as high as with conventional electromagnetic machines. Efficiency is 90%.

More detailed information on matters dealt with in the report may be obtained on application to the Intelligence Division, D.S.I.R., Charles House, 5 Regent Street, London, S.W.1.

*A Brief Review of Science and Technology in Western Germany, published by H.M.S.O., price 4s.

Testing Servo-Mechanisms

THE introduction of automation and advanced process control inevitably involves the use of servo-mechanisms, and it is vital to the overall system design that the performance of the servo mechanisms involved, particularly as regards speed, accuracy and stability, should be capable of precise assessment. While this can be carried out generally by laboratory methods, the speed of advance in this field is such that a requirement is arising for the mass production testing of servo systems. This need, it is claimed, has been solved satisfactorily by the Solartron Electronic Group, who recently exhibited in America among other instruments, two recently developed servo-testing units.



An experimental voltage control hook-up, the performance of which is begin determined by the Transfer Function Analyser and stabilised power supply (Birmingham College of Technology)

The most advanced of these—and believed to be the most advanced in the world—is the Transfer Function Analyser. This is designed to test servo mechanisms where the servo output may be non-linear, and will also measure the "efficiency" of almost every type of servo mechanism manufactured. It consists of two units, a low frequency decade oscillator, and a low frequency phase sensitive voltmeter. The oscillator covers the range of 0·01 c/s to 11·1 kc/s and provides a four-phase output (0°, 90°, 180° and 270°) of constant amplitude over the entire coverage. All phases are connected to the voltmeter to provide a reference base, a second oscillator output being available through an attenuator for application to the test servo mechanism via appropriate transducers or similar converters. The output from the servo, after conversion, is applied to the signal input of the phase sensitive voltmeter and is compared with the reference signal. The comparison is indicated on two six in. thermocouple-type wattmeters giving the "in-phase" and "quadrature" components of the signal with reference to the servo input signals. The readings of the meters are in Cartesian form and a Nyquist diagram can thus be readily plotted. The use of thermocouple meters avoids effects due to harmonics or distortion within the input channel signal. The cost of the instrument complete is about £1,200.

Chimneys — and SMOKE DISPERSAL

INSTITUTE OF FUEL PAPER GIVES PRACTICAL DESIGN FORMULAE

THE behaviour of chimney emissions under various atmospheric conditions has received much attention over the past few years, and investigations into this important subject have been stimulated by the findings given in the Final Report of the Government Committee on Air Pollution Cmd. 9322 (H.M.S.O.), which also discussed measures which should be taken before the installation of plant which would emit large quantities of gases.

A recent attack on the general problem was made by Messrs J. E. Hawkins and G. Nonhebel in a paper presented yesterday to the Institute of Fuel. The paper, "Chimneys and the Dispersal of Smoke" began by mentioning that the design of chimneys to effect good dispersion of smoke was illustrated by the practice of the electricity generating industry and by the exceedingly tall chimneys (over 600 ft tall) erected at smelter plants in North America. The tall chimneys of modern power stations are not required to create draught but to improve the dissipation of smoke.

The relation between chimney height, rate of emission of flue gas and concentration at ground level to the lee of the chimney had been the subject of much investigation both theoretical and experimental. It had been noted that when a wind blew across a building a region of low pressure and strong turbulence formed in the down-wind side of the building. This region stretched from the top of the windward side of the building, rose to about twice the building height and stretched for about six times the height down-wind of the building. To avoid smoke being affected by this region the Electricity Commissioners proposed a rule that the height of chimneys should be 2½ times the height of adjacent buildings, and this rule had been used successfully by the electricity industry for the past twenty years. There was, however, some evidence that with strong winds, cool gas plumes could be brought down, even when the chimneys obeyed the 2½ times rule.

Another source of difficulty was caused by the eddies arising in the "wake." These were generally vertical and could bring smoke down into the region of down-draught. This could be avoided by making the ratio of exit velocity to wind velocity sufficiently high.

Mathematical studies had been made whereby it was possible to obtain quantitatively the dilution of a smoke cloud as it dispersed, and from these studies formulae had been derived which enabled the location of the point of maximum concentration to be found, and the value of the concentration itself to be derived.

Temperature and Gas Velocity

The velocity of emitted gases was of great importance. One pound of boiler flue gas at 150° C had, in air at 10° C, a buoyancy of about ½ lb weight, which would give it a momentary acceleration, if there were no resistance to its motion, of about 14 ft/sec. Thus adding heat to the gaseous effluent reduced the ground level concentrations. The height of emission could be defined as that height at which the velocity of the plume was zero or negligibly small. This height depended on controllable factors such as velocity of emission, volume and temperature of the gas emitted, and upon uncontrollable meteorological factors such as mean wind speed and variation of atmospheric temperature with height. Formulae had been derived by Bosanquet, Carey and Halton to calculate the height of the hot gas smoke plume, and although the results could not be highly accurate, a fair measure of agreement was possible using Bosanquet's modified formula.

The pollution at ground level could extend to very great distances from the chimney. In a report on observation of sulphur dioxide pollution by smelting plants, values had been quoted for concentrations at a point 58 miles from the plant. The area polluted was in the form of a long narrow streak beginning where the plume first reached the ground and stretching away down-wind.

Gas Washing

At two large London power stations, the major part of the sulphur in the flue gases was removed by a once-through washing process, which reduced the temperature of the gas and saturated it with water vapour. This had been criticised on the grounds that the washed plume lost much of its thermal buoyancy and spread to the ground much more quickly than the unwashed plume, so that the maximum concentration due to the washed plume was comparable to that of the unwashed plume. Calculations had shown that this was not so, although there was a chance of an occasional whiff of concentrated flue gas reaching the ground.

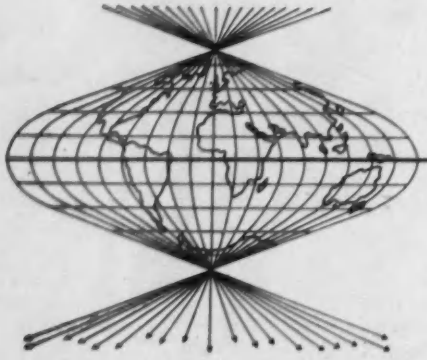
In the present state of knowledge it seemed fair to say that gas washing reduced the average concentration of sulphur dioxide pollution over large areas remote from the chimney, but that it might, particularly with effluent processes, lead to occasional puffs of moist concentrated flue gas at ground level near the chimney.

Finally, it was pointed out that theory and observation had shown that the use of one instead of several old chimneys to discharge the flue gases from a battery of furnaces increased the effective height of emission and so reduced the ground level concentration. The rate of deposition of fine dust from some old power stations with short chimneys on each boiler had, in fact, been greatly reduced by discharging the gases from the whole plant through one or two high chimneys.

Nuclear Power in Russia

RUSSIA'S first nuclear power station generated 20 million kWh during the first seventeen months of operation. This was stated in an interview with the director of the station, a Mr N. A. Nikolayev, which was broadcast this week by Moscow radio. He further stated that in generating this energy, the station had used five kilograms of uranium.

The Russian station is an enriched uranium-fueled, graphite-moderated, pressurised-water-cooled design, with a rated heat-generating (not electric) capacity of 30 MW. The total charge of enriched uranium (5% U235) is 550 kgm. The cooling circuit carries ordinary water at 1,500 lb/sq in., and steam is generated in a second water circuit and used in a 5 MW turbo-generator. Thus the load factor has been only 32%. The station first generated electricity on 27 June, 1954.



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Nova Scotia Plant

A new 37,000 h.p. Metropolitan-Vickers steam turbine was recently inaugurated at the Water Street plant of the Nova Scotia Light and Power Co. The company has already ordered two more 30,000 h.p. generators for installation at the station in 1957 and 1959, to meet the increasing load, and planning is well advanced for the development of a 500,000 h.p. generating site at Tuft's Cove.

Expansion in B.C.

Total units sold by the British Columbia Power Commission during the year ended 31 Mar. last amounted to 824·8 million units—an increase of 18%. More than half that total was by way of bulk industrial sale. A further 3,784 consumers were supplied, raising that total to 56,557. There were notable increases in the number of electric cookers, water heaters, and electrically heated dwelling installations which resulted in an increase in the average residential consumption from 204 units a month in 1953-54 to 233 units during past year. Consumer density is now 17·1 per mile, compared with 18·5 four years ago—an indication of the increasing extent to which rural territory is being served by the Commission. The Commission now operates four hydro-electric plants with a total capacity of 150,700 kW, and 19 diesel generators with an aggregate capacity of 26,166 kW. There are also 689 miles of transmission line of over 23 kV and over 3,300 miles of distribution line in service. Many surveys have been undertaken for likely future power development sites, notably on the Quesnel River and Murtle River. Industrial expansion in the Province shows no sign of slackening and with increasing demands for power there should be many opportunities for British manufacturers of electrical equipment. Since February last the Commission has had a new general manager and chief engineer—Mr H. L. Briggs, formerly general manager of the City of Winnipeg Hydro-Electric System.

U.S.A.

Tenders Again

Conflicting reports on the labour situation in the Pittsburg area have delayed announcements on four contracts to be awarded by the Interior Department's Bureau of Reclamation, for one of which the English Electric Co.'s tender is 11·4% lower than the best American price, while for another the Italian Legnano concern's bid is 12% below the next lowest, we understand. The Interior Department, however, is proposing to allocate the contracts to American firms who were in areas having a labour surplus. It will be recalled that a recent low price tender of the English Electric Co. was rejected in favour of that of an American firm on the grounds of local unemployment. So far a foreign firm's price has had to be at least 6% below a U.S. tender to be considered, but officials of the Interior Department have now indicated that the percentage is likely to be raised to 15% where American firms in areas with a surplus of labour are involved. Pending final determination of the position, the award of the new contracts has been delayed. The four contracts involved are: transformers for the Palisades dam and power project; for Minidoka and Rapid City, and circuit-breakers for Granite Falls substation.

HONDURAS

H.E. Proposals

It seems likely that the Rio Lindo hydro-electric project will shortly be started on by the Honduras Government. Mr G. F. Kennedy, partner in the firm of Kennedy and Donkin, consulting engineers, is now in Honduras at the invitation of the government, in connection with arrangements for appointing consulting engineers for the project, the total cost of which is estimated at 22m lempiras. A technical survey of the scheme has already been completed. In this it was estimated that the initial capacity of the plant would be 15,000 kW, with ultimate capacity in the region of 100,000 kW. The Honduras Government has had talks with officials of the International Bank for Reconstruction with a view to obtaining a substantial loan to finance construction of the project, which it has been suggested, should be operated by a National Electricity Company set up for that purpose.

SOUTH AMERICA

Aluminium and H.E. Project

Plans for the construction of a hydro-electric plant and an aluminium production factory have been prepared by the Government of Surinam (previously known as Dutch Guiana). Capacity of the aluminium factory has been estimated at 40,000 tons annually, and to supply the plant with power it is proposed to establish a large hydro-electric station on the Surinam River, involving the construction of a massive dam. The project would require a loan of over Fls.80m. We understand that the Dutch Government is likely to take an interest in the scheme jointly with private interests. Surinam is, of course, a large producer of bauxite, the raw material from which aluminium is made.

PORTUGAL

H.E. Progress

The third and last dam on the River Zezere, at Bouca, Portugal, is due to be inaugurated next weekend. This will provide additional water storage for the hydro-electric stations along the river, for which much of the equipment has been supplied by the "British Group"—a combination of the English Electric Export and Trading Co., and the Metropolitan-Vickers Electrical Export Co., Ltd.

AFRICA

Bulk Supply for Umtali

Arrangements have just been completed between the Electricity Supply Commission of Southern Rhodesia and a power concern in Portuguese East Africa under which the latter is to provide a bulk supply to the Commission at Umtali, commencing in May 1957. Under the agreement just signed, which covers a period of approximately ten years, the Commission guarantees to take a total of 1,500 million units over that period, with a maximum demand initially of about 5 MW, rising eventually to around 24 MW. The Portuguese concern already has a hydro-electric power station on the Revué River in which two 5 MW sets are operating, and the dam is to be raised and three 12 MW sets installed to provide the bulk supply which will be transmitted to Umtali, a distance of about 75 miles.

Why Not Copper?

The proposal of the Federal Hydro-Electric Board of Rhodesia and Nyasaland to use steel-cored aluminium conductors for the 330 kV transmission line from Kariba (reported in our 27 Oct.

issue), has caused some query in Rhodesia—the source of large quantities of copper, we hear. A spokesman of the Board has explained that at the present price of copper, the use of copper conductors would increase the cost of the whole scheme by at least £6¼m. There were also technical considerations. "Had the Federation anything in the nature of a surplus of copper the Board would doubtless have given careful consideration to the factor. But at present the country can dispose of all the copper it can produce on terms highly advantageous to the national economy," he added.

S.W. ASIA

Fan Production

Census of production returns recently announced by the Pakistan Central Statistical Office show that during 1953 eight firms produced various types of electric fans to a total value of 3·2m rupees. In all, a total of 814 persons were employed in production, but the return relates only to factories which employed 20 or more persons.

Mysore's Plan

Two new hydro-electric schemes and further power extensions to villages are included in proposals being studied by the Mysore Planning and Development Board for inclusion in India's Second Five Year Plan. It is proposed to take up the first stage of the Sharavati valley hydro-electric scheme, and to construct the Shimsha water power project. The implementation of the latter is necessary with a view to meeting the interim demand for power between 1956 and the time when power from the Sharavati project becomes available. The Shimsha is a short-term scheme which, it is estimated, would be completed within 24 months. It is also proposed to spend a further Rs. 5 crores on providing power supplies for a further thousand villages.

AUSTRALIA

Western Australia's Advance

The completion of South Fremantle power station, and good progress in the construction of Bunbury generating station are recorded in the report of the State Electricity Commission of Western Australia for the year ended 30 June last, which, as we have already noted, resulted in a net surplus of £222,483. Altogether, over 354·5m units were sold during the year, an increase of approximately 15%. Mr F. C. Edmondson, the general manager and chief engineer, reports that the heavy demand for electricity extensions continued throughout the year, a further 139 miles of main transmission line being erected. The construction of the first 132 kV transmission line from Bunbury to Perth was commenced in Jan. last, and by the end of June all poles were carted into position. 71 miles of the two pole line structures were assembled on the ground and 26 miles of those structures were erected. In extensions in the country districts 922 miles of conductor were erected to provide supplies to new consumers. We also note that the greater use of the new higher efficiency plant at the South Fremantle power station resulted in a reduction from 1·75 lb of coal used per unit generated to 1·67 lb at the two major stations.

Next Snowy Project

With steady progress being made in the Snowy Mountains hydro-electric scheme, it is now anticipated that tenders will shortly be called for work and plant involved in the next stage of the major plan—the Adaminaby dam, Tooma-Tumut tunnel and Tooma dam, and the T2 power station. The latter is scheduled to have an installed capacity of 280 MW made up of four 70 MW sets. The station and associated work is expected to be completed early in 1957.

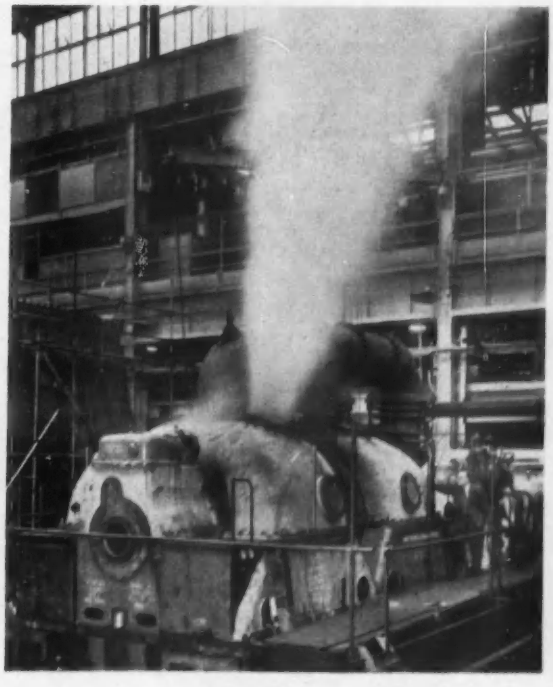
Steel Plant

The British Thomson-Houston Co., have received through their associated company, Australian Electrical Industries Pty. Ltd., an order worth approximately £400,000 for the Broken Hill Proprietary Co., Ltd., Australia. This covers the electrical driving equipment for an 18 in. continuous steel strip and skelp rolling mill to be installed at the Broken Hill Proprietary Co.'s Newcastle Works, New South Wales. The B.T.H. plant includes fourteen d.c. motors totalling 9,800 h.p., two 3,500 kW banks of grid - controlled mercury-arc rectifiers for supplying electric power to the motors, together with all the associated control gear.

NEW ZEALAND

Future Schemes

Reconnaissances with a view to possible power development in New Zealand in the future were made during the past year of the central volcanic region between Turangi and Waiouru and of the Bay of Plenty rivers, extending eastwards from the Rangitaiki to the Motu. Reconnaissances were also made of the Ngaruroro River in Hawke's Bay. The annual report of the Ministry of Works recently tabled in the House of Representatives states that it seemed that the total potential of the Bay of Plenty rivers was considerable. Regarding the possibility of Tongariro development, though the nature of the terrain called for specially careful consideration, the diversion into Taupo and the Waikato River of a considerable flow from the Wanganui and other rivers appeared to be practical. Such a diversion should not only make possible a development of the order of 200 MW. in the upper Waikato, but the additional water would generate extra units in all the lower Waikato stations, such as to be equivalent to a large generating station. It was proposed to put in hand field investigations of this important potential. A reconnaissance of the Egmont area would be made in the near future. This would include all the main streams flowing west and south between Kawhia and Wanganui. Eight power projects—Huka, Aratiatia, Pararíki, Okataina, Tarawera and three projects on the Kaituna River—were at present under investigation. In addition seven major projects, being alternative schemes for development of the Te Anau-Manapouri lake system, were in the initial planning stage.



A 66 MW steam turbine-generator for the Calgary Power Co., Ltd., is seen alongside undergoing tests at the Trafford Park works of the Metropolitan-Vickers Electrical Co., Ltd. The test illustrated involves the deliberate fracture of one of the rupturing diaphragms fitted in the turbine casing. In service, the rupturing diaphragm would function only in the event of an excess of pressure in the turbine exhaust, such as might arise from an interruption of the cooling water supply, and the consequent loss of vacuum. The new set consists of a two-cylinder turbine operating with inlet steam conditions of 850 p.s.i.g., 900° F and driving a 13·8 kV a.c. hydrogen-cooled generator. It will form the initial machine in a new power station of the Calgary Power Co. at Wabamun, near Edmonton, Alberta

Personalities

IN THE INDUSTRY

Mr T. M. Lucocq has been appointed branch manager to the General Electric Co., Ltd., at Swansea. He joined that company in 1936 as a general representative, and in 1938 was appointed sales representative, South Western District and Devon, for Claude General Neon Lights Ltd., a subsidiary of the G.E.C. After war service he returned in 1946 to Claude General Neon Lights Ltd. Later in 1947 he rejoined the parent company as general representative and, in Mar., 1949, was appointed manager, installation supplies department, Cardiff. He is succeeded in that appointment by **Mr E. Reeves** of the G.E.C. Gloucester branch.

Due to retire in Jan. next is **Mr W. Moody,** M.I.E.E., who has been manager of the Yorkshire Electricity Board's No. 5 (Wakefield) sub-area since vesting day. For a period he was also manager of the Board's No. 4 sub-area on the retirement of Mr Frank Nicholls, M.I.E.E., in 1951. Mr Moody obtained early experience at the Phoenix Works, Bradford, and at Dick Kerr Works, Preston, after which he served the English Electric Co. as an outside tester and erector of rotating electrical machines. Later he was liaison officer in the Design and Outside Testing Departments, and from 1919 to 1928 was sales and technical commercial engineer to the company. Mr Moody then entered the Supply Industry, joining the Yorkshire Electric Power Co. as technical sales engineer, and from 1935 to vesting day was sales manager to that concern and its associated companies.

Due to leave today in the *Queen Mary* for a three-week business tour is **Mr J. M. Brooke,** managing director of the Venner group of companies. The varied interests of the Venner Group will be served by visits to the Yardney International Corporation, New York, the Magee Hale Park-O-Meter Co., Oklahoma City, and a visit to the Canadian licensees of the Andre-Yardney silver-zinc accumulator, Silvercell of Canada Ltd., in Toronto. Mr Brooke returns to New York for further business deals before his departure from the U.S.A. on 1 Dec.

Following the retirement of **Mr C. E. Beames** as district commercial manager, District 348 (Cardiff West), of the South Wales Electricity Board (as we have already noted), **Mr P. Wiseman** has been appointed to succeed him. Mr Wiseman was formerly assistant district commercial manager in the Cardiff West district.

After serving in the Electricity Supply Industry for nearly fifty years, **Mr W. S. Sawtell,** M.I.E.E., is to retire when his term of office as a full-time member of the South of Scotland Electricity Board ends on 31 Dec. next. Mr Sawtell was, of course, deputy chairman of the South East Scotland Electricity Board from its formation in 1948 until the establishment of the South of Scotland Board this year. Earlier, he was for a year general manager of the Fife Electric Power Co., and prior to 1947, general manager of the Scottish Southern Electric Supply Co., for 24 years. Prior to 1923 he served with the Dundee Corporation undertaking.

Shortly retiring from the position of district commercial manager, district 466 (North Breconshire and Radnorshire) of the South Wales Electricity Board, is **Mr C. C. Wilde,** A.M.I.E.E., who has served in the Industry for 51 years. Prior to nationalisation, Mr Wilde was engineer and manager of the Llandridod Wells U.D.C. undertaking for 25 years. Although retiring from his present appointment it has been arranged that Mr Wilde will continue to serve the South Wales Board in their Brecon office during the absence through illness of a senior member of the staff. Mr Wilde's successor as district commercial manager district 466, is **Mr G. H. Farnon,** an assistant commercial engineer with the North Western Electricity Board.

In order to obtain information on present conditions in some South American markets, **Mr Rodney Kent,** sales director of George Kent Ltd., left by air on 6 Nov., to spend a month in that area. He is due to arrive back in this country in mid-Dec., and will visit Kent agencies and principal customers, including the oil industry and many municipalities in Brazil, Uruguay, Argentina, Venezuela, Cuba and Mexico. While in Argentina, he will, as a director of Agar, Cross and Co., Ltd., work in close association with the Agar Cross head offices in Buenos Aires, in addition to visiting branches in other parts of the Argentine.

Chief of the Data Department, Rugby, of the British Thomson-Houston Co., Ltd., **Mr F. R. Newton,** has retired after nearly 36 years service with the company. On leaving Birmingham Central Technical College, Mr Newton became apprenticed to W. Canning and Co., Ltd., on completion of which he joined Siemens Bros. Dynamo Works, Stafford, in the drawing office, later working as a draughtsman for short periods at Vickers Ltd., Barrow-in-Furness, and the Humphrey Pump Co., Ltd., Dudley Port. In 1914 he returned to Siemens Bros. but soon afterwards joined the Royal Flying Corps, later holding commissioned rank (R.A.F.). On leaving the latter in Mar., 1920, he joined the British Thomson-Houston Co. at Rugby as a draughtsman, subsequently being put in charge of a section. In April, 1946, he became deputy chief of Data Department, taking over complete charge the following year when the late Mr. S. W. Gibson retired.

Mr W. Moody

Mr J. M. Brooke

Mr. W. S. Sawtell

Mr R. Kent

Mr F. R. Newton

At the Essex branch E.I.B.A. Dinner-Dance

A successful dinner-dance was recently held at the Queen's Hotel, Westcliff-on-Sea, by the Essex branch of the E.I.B.A., when over 300 people attended. It is hoped that a sum of not less than £150 will be forwarded to augment the funds of the E.I.B.A. Our accompanying photograph, taken at the function, shows, left to right: **Mr H. Senior Fothergill** (secretary, E.I.B.A.); **Mr C. Merrells** (hon. treasurer, Essex branch); **Mr C. T. Melling** (council member, E.I.B.A., and chairman of the Eastern Electricity Board); **Mr W. E. Wardrop** (chairman, Essex branch) and **Mr E. E. Cooper** (hon. secretary, Essex branch).

Substation engineer in the Eastern subarea of the South Wales Electricity Board, **Mr J. N. Hodges,** was the recipient of a presentation from the subarea staff last week. Mr Hodges is leaving the Board to take up an appointment with Richard Thomas and Baldwins Ltd., at the Ebbw Vale Works.

The Royal Society has awarded the Hughes Medal to **Prof H. S. W. Massey,** F.R.S., Quain Professor of Physics at University College in the University of London, for his distinguished contributions to atomic and molecular physics, particularly in regard to collisions involving the production and recombination of ions.

Foundry manager with C. A. Parsons and Co., Ltd., **Mr R. H. Smith** has retired after 52 years service with the firm, and has been presented with a television set. Mr Smith was president of the local branch of the Institute of British Foundrymen in 1949-50.

Mr A. E. Millard, managing director of Walsall Conduits Ltd., has resigned following a prolonged period of ill health. Mr. Millard has been in the service of the company for a period of 51 years and managing director since its flotation as a public company in 1936. He will still retain his seat on the board of directors. The assistant manager, **Mr L. H. Butler,** has been promoted to managing director to succeed Mr Millard. He has been in the service of the company for a period of 27 years and a director since 1945.

Mr G. E. Bishop

We learn that **Mr G. E. Bishop,** A.M.I.E.E., who was formerly with Maintenance Contracts, Ltd., has been appointed southern area capacitor engineer to Bryce Electric Construction Co., Ltd., in succession to Mr F. Baker whose death we reported in our 29 Sept. issue.

Mr J. H. Mitchell, an assistant secretary in the Ministry of Labour and National Service, has been appointed to the new post of deputy director-general (manpower and training) in the Industrial Relations Department of the National Coal Board, at headquarters.

Production manager of Hoover (Washing Machines) Ltd. at Merthyr Tydfil, **Mr M. G. Lane,** M.I.PROD.E., has just completed 25 years' service with Hoover Ltd., and, to mark the occasion, has been presented with a gold watch by **Mr S. Roberts,** managing director.

Formerly chief engineer to J. and H. McLaren Ltd., **Mr N. A. Deighton** has been appointed chief engineer (sales) to the company. **Mr J. R. Fish,** formerly chief designer, is now chief engineer (design).

Mr John Shirreff has been appointed vice-president of Johnson Matthey and Mallory Ltd., the Canadian associate of Johnson, Matthey and Co., Ltd. He joined the parent company in 1927 and was employed in the platinum department at Hatton Garden until Sept., 1939, when he left to take up war service. He resumed his duties in the platinum department in 1945, having served with the rank of major. In 1949 he left to join the Canadian associate, since which time he has been principally concerned with sales in Canada.

We understand that the appointment of **Mr Alan N. East,** C.B.E., M.I.E.E., as sales consultant to the Bryce Electric Construction Co., after being extended for a further year, terminated on 1 Nov.

For the post of technical assistant, the Jersey Electricity Co., Ltd., has appointed **Mr J. W. Iceton,** now with the North Eastern Electricity Board, who will be taking up his new duties on 1 Dec.

Mr H. L. Perry, GRAD. I.E.E., who has been connected with the cable industry for some years, has now joined the Cable Division of Connollys (Blackley) Ltd., as southern area representative, operating from the London office. His selling activities includes Blackley tape.

Mr R. G. McLennan has been elected assistant general secretary of the Electrical Trades Union. He secured 28,779 votes, compared with 13,426 for his opponent, Mr J. T. Byrne, the Glasgow area secretary. Mr McLennan has been a national officer of the union.

Formerly district engineer at Stroud, Midlands Electricity Board, **Mr E. L. Tapson,** A.M.I.E.E., has now taken up duties at the Board's Central Gloucestershire sub-area headquarters as senior assistant engineer (commercial). A Londoner, Mr Tapson was educated at Hastings Grammar School and Brighton Technical College, and gained early experience with the Hastings Corporation Electricity Department. In 1938 he joined the Barrow Corporation undertaking, and in 1943 went to the West Gloucestershire Power Co., as assistant district engineer, being promoted to district engineer in 1947.

OBITUARY

Mr R. L. Potter, divisional sales manager to Elliott Bros. (London) Ltd., died on 25 Oct., aged 56. He joined that company in Mar., 1923, immediately after leaving Loughborough College. Until 1930 he worked in the test room but then joined the newly-formed Heat Control Division, which he helped to found. Towards the end of the same year, he was appointed as the division's first service engineer and, in the years that followed, as service manager built up the present Service Department. Mr. Potter was later appointed divisional sales manager and was still holding this position up to the time of his death. In addition to his wide knowledge of industrial instrumentation, he took a specialised personal interest in the problems raised by fruit farmers and shippers.

Mr N. C. Bridge, M.I.E.E., M.I.MECH.E., M.CONS.E., senior partner with Strain and Robertson, consulting engineers, Glasgow, died on 7 Nov. He designed the old Yoker and Clyde's Mill power stations.

Mr R. H. A. Deane, M.I.MECH.E., M.I.E.E., who died on 28 Oct., aged 69, was formerly stations superintendent to the St. James's and Pall Mall Electric Light Co., Ltd., for many years, retiring from that position at the end of 1947.

Mr F. S. Sexton, A.R.C.S., A.M.I.E.E., A.INST.P., managing director of the Thames Electric Co., Ltd., for many years, died on 2 Nov., aged 73. He started with that concern in 1910, but was for a time associated with S. G. Brown Ltd., and the National Physical Laboratory. He also had a long association with the teaching profession, particularly at Woolwich Polytechnic and Battersea Polytechnic, and many students will also know him as the author of "Definitions and Formulae—Electrical Installation Work."

Mr A. C. Campbell, A.M.I.E.E., formerly electrical engineer at the Royal Mint, died on 31 Oct., aged 92.

Mr S. Booth, a director of the British Vacuum Cleaner and Engineering Co., Ltd. has died. He joined that concern in 1904.

Mr E. I. Mavor, joint managing director of Mavor and Coulson Ltd., and a director of M. and C. Switchgear Ltd., died on 6 Nov., aged 61.

NEW LITERATURE

Principles of Electric Utility Engineering

by C. A. Powel

IN America, the problem of securing sufficient recruits for the power supply section of electrical engineering has been, if anything, even more severe than in this country. The lures of telecommunications have proved strong, and special measures have been felt necessary to show that there is still interesting and worthwhile work to be done in power engineering. This book is one instance of the special steps taken. It is a collection of lectures offered at Massachusetts Institute of Technology with the object of showing undergraduates the range of technical and management work involved in American supply companies. As such, it provides a relatively simple introduction to applied electrical engineering, together with some comments on current practice in America. It could make interesting reading for university students in this country who wish to supplement the usual general textbooks describing British practice at a general level. Published by Chapman and Hall, 251 pages, 9 in. by 6 in. Price 48s.

Indian Electrical Year Book

WITH the aim of covering every aspect of the electrical industry in India this third edition has been further expanded. The volume is segregated into ten sections, some of which are printed on coloured paper for easy reference. Beginning with specifications and technical information, other sections list manufacturers and their representatives, addresses of contractors and traders in each State, followed by similar information in regard to the power supply undertakings. A buyers' guide and sections devoted to the various associations and some tables complete this comparatively well produced volume which should be of considerable assistance to manufacturers and others interested in the Indian market. Published by M. Largs-Afonso, Bombay. 304 pages, 9¼ in. by 7¼ in. Price 25s. post free.

Automatic Protection of A.C. Circuits

by G. W. Stubbings, B.SC., A.M.I.E.E., F.INST.P.

FIRST published in 1934, this well-known work of the late Mr G. W. Stubbings has been thoroughly revised in this fourth edition by Mr C. Dobson, ASSOC.I.E.E. While the general plan of the work has been retained, a chapter has been added on the important topic of neutral earthing. This reviews advantages of the various methods of neutral earthing on transmission systems with particular attention to current and voltage magnitudes under fault conditions.

In the present edition, the book begins with a brief survey of the types of protective gear, and then passes on to deal with the design, characteristics, and connections of current and voltage transformers. Next come a presentation of the theory of symmetrical components which is somewhat mathematical, but readily understandable. The next chapter then treats in an essentially descriptive manner the types of relay used in protective schemes, and the chapter on earthing already mentioned follows. Finally, come two long chapters describing protection schemes appropriate for various machines and supply circuits, and some notes on the testing and maintenance of protective gear. Guidance is offered on the selection of types of protection to meet the differing conditions that arise in practice. In its new edition, this work continues to provide non-specialist engineers with an excellent introduction to this important subject. Published by Chapman and Hall, 355 pages, 8½ in. x 5½ in. Fourth edition, price 50s.

Australia's Power Resources

edited by N. R. Wills

DURING 1954, the Australian Institute of Political Science organised a meeting at which the fuel problem of that Commonwealth was considered in papers presented by various eminent authorities. The present volume collects together these papers, together with critical comment on their contents by other Australians prominently concerned with the five "fuels" discussed—nuclear energy, petroleum, hydro-electricity, black coal and brown coal. Apart from its intrinsic interest to anyone directly concerned with Australia's future, this treatment of a subject so often thrashed out in this country is likely to hold the interest of many readers in the British Isles. The papers are all presented in a lively and combative style, and provide a painless method of becoming acquainted with the outlines of Australia's fuel future. Published by Angus and Robertson Ltd., 105 Great Russell St, London, W.C.1. 149 pages, 8½ in. by 5½ in. Price 12s. 6d.

Lightning Protection for Electric Systems

by E. Beck

LIGHTNING has so unpredictable a character that protection, of necessity, must be based largely on statistical probabilities, effecting a compromise between the worst possible, the probable, and economics, and such, broadly, forms the basis of this eminently and usefully practical book which, despite its American accent, has much to offer the British supply engineer. Since lightning arresters play so dominant a part in protective systems, most of the text is devoted to them, and, in fact, little consideration is given to the use of auto-reclosing switchgear and fuses or other protective devices. After discussing the need for protection, and lightning itself, direct stroke shielding is briefly considered before discussing insulation, co-ordination and impulse voltages as an introduction to the main part of the work, lightning arresters. These are considered in some detail discussing different types evolved for different parts of the network, their selection and location, possible causes of danger to them and application to "standard" and special cases. Published by McGraw-Hill, 313 pages, 9 in. by 6 in. Price 52s.

B.B.C. Handbook 1956

FOR those seriously interested in the organisation and work of the B.B.C. this new edition provides up-to-date information, with a wealth of statistical data. It covers such matters as the economics of broadcasting, wavelengths, studios and problems of reception, giving an outline of the functions of the programme departments and the engineering services. Practical advice is also included for those wishing to apply for auditions. To make reference easier, the index has been enlarged, cross references having been made wherever possible. Published by the B.B.C. 288 pages. 7 in. x 4¾ in. Price 5s.

Automatic Feedback Control System Synthesis

by J. G. Truxal.

THE development of automatic control systems based on closed loop feedback has evolved a number of methods of designing such systems, which is based on the general principle of synthesising a central system from components having the linear characteristics desired. It will be appreciated, however, that ideally, the complete system should be designed as a whole to meet the required specification and it is to this end that this scholarly work on control system design is aimed. Intended for the graduate specialising in servo mechanism design, and for the design engineer, it must be emphasised that this book assumes its reader to have mastered the introduction to the subject. In particular, a knowledge of the elementary aspects of Laplace transform theory is expected. In its scope, it sets out to organise and unify the background material in the five fields related to the synthesis of feedback control systems—working familiarity with the Laplace transform, fundamental concepts of feedback theory, synthesis of appropriate compensation network, statistical methods of design, and basic techniques available for considering non-linear systems. From an introductory review of the mathematical background, the book devotes the next two of its eleven chapters to basic theory. Important aspects of design, described in terms of the Laplace transform, then follow, continued by fundamental concepts, and later, certain applications of statistical design theory. The basic characteristics of sampled-data feedback systems are considered, before concluding with two chapters on non-linear systems. Published by McGraw-Hill, 675 pages, 9¼ in. by 6¼ in. Price 89s. 6d.

Magnetic Amplifiers

by Dr H. F. Storm and associates

HAD it not been for the development of the thermionic valve, magnetic amplifiers, like transistors, would have shed long ago the aura of novelty with which they are still surrounded since they were used as audio-frequency modulators as long ago as 1916 in a radio link between the U.S.A. and Europe. But, taking their similarity with transistors a stage further, they had to await the evolution of improved materials before their ascendancy over the electron valve in many applications could be demonstrated. Today, of course, their field of utilisation is steadily widening, as amply demonstrated in this comprehensive and thoroughly readable treatise. Although the magnetic amplifier is the focal point of this work, which, despite its American nationality, deserves a place on the bookshelf of both advanced student and practising engineer, the scope extends to modern magnetic theory, characteristics of magnetic materials, magnetic testing, manufacture of saturable reactors and properties of metallic rectifiers, among other aspects. The theory of magnetic amplifiers is limited to single phase operation, developing the subject in logical order from the ordinary saturable reactor. Published by Chapman and Hall, 545 pages, 9 in. by 6 in. Price 108s.

BOOKS RECEIVED

Industrial Power Systems Handbook, ed. by D. Beeman. Outlines up-to-date American industrial power system engineering practices for engineers associated with plant, power application, supply, consulting and contracting. Published by McGraw-Hill, 971 pages, 9 in. by 6 in. Price 94s.

Elements of Electronics, by H. V. Hickey and W. M. Villines. Based on authors' experiences as U.S. Navy Radio Engineers, provides course for training radio and electronic technicians in fundamentals of the subject. Published by McGraw-Hill, 487 pages, 9 in. by 6 in. Price 37s. 6d.

Principles of Electrical Measurements, by H. Buckingham and E. M. Price. Covering requirements of Final Degree and I.E.E. examinations and H.N.C. and H.N.D. courses, provides text book covering principles involved and methods of application. Published by the English Universities Press, 600 pages, 8½ in. by 5½ in. Price 37s. 6d.

Appareils et Installations Télégraphiques, by D. Faugeras. In French, gives a study of telegraph equipment and its installation for engineers and post graduates. Published by Editions Eyrolles, 61 Boulevard St. Germain, Paris Ve, 562 pages, 9¾ in. by 6¼ in. Price 3,900 fr.

The Lineman's Handbook, by E. B. Kurtz. Practical account of locating, erecting, testing, inspecting and maintaining o.h. lines, for apprentices, linesmen, and supervisors. Third edition, published by McGraw-Hill, 750 pages, 8 in. by 5¼ in. Price 64s.

High Vacuum Technique, by J. Yarwood. New edition of survey of theory practice and industrial applications of the subject, for both students and professional workers. Third edition, published by Chapman and Hall, 208 pages, 8½ in. by 5½ in. Price 25s.

The Principles of Technical Electricity, by M. Nelkon. New edition sees an appendix on M.K.S. system and few changes in main text, for City and Guilds Telecommunications I and II students. Second edition, published by Blackie, 250 pages, 8½ in. by 5½ in. Price 10s. 6d.

National Electrical Code Handbook, by Abbott, revised by C. L. Smith. Latest position of a guide for American contractors to the American National Electrical Code, being based on the 1953 edition of the Code. Eighth edition, published by McGraw-Hill, 642 pages, 8 in. by 5½ in. Price 56s. 6d.

South African Progress

INSTALLED capacity of the power stations of the Electricity Supply Commission of South Africa increased to 2,051,550 kW by the end of 1954, it is shown in the report of the Commission for that year. Thus, since 1954, there has been added over 836,200 kW of generating capacity to the Commission's system, and a further 930,000 kW of plant is under construction or on order.

The largest expansion has taken place in the Rand and Orange Free State undertaking, where capacity has risen from 783,500 kW in 1945 to 1,329,500 kW at the end of last year, with an additional 720,000 kW of plant under construction or on order. Installed capacity of the Cape Northern undertaking is now 31,000 kW, but additional power is to be supplied from the pooled stations of the Rand undertaking which are being interconnected with the Kimberley station via a 132 kV transmission line now under construction.

Altogether the Commission has designed and built eight new power stations in the past nine years, of which one, the Swartkops station near Port Elizabeth, was subsequently sold to the City Council of that town. Swartkops was constructed and operated by Escom under conditions totally different from those of the other stations of the Commission. It was, in fact, operated to supply only the needs of the undertaking of Port Elizabeth City Council. Thus, when in June 1953 the latter expressed a desire to purchase the power station, the Commission agreed and the purchase was duly completed in April 1955.

Much preliminary work has been done in the design of the further new power station for the Rand and O.F.S. undertaking and in April last tenders for plant for that station were being adjudicated.

On the commercial side, an increase of 10·81% in units sold is shown in the report—the total is 9,676·5 million units for the year. There was a further large increase in the maximum demands of local authorities who take a bulk supply from the Commission. Special attention has also been given to the needs of the smaller towns, especially in the country districts, up to the limit of the resources available.

Considerable progress was made with the supply to rural consumers and during the past year the Commission connected up 655 rural consumers of whom 221 were farmers. In the Cape Western undertaking farm schemes were developed at Kraaifontein, Durbanville, Klipheuwel, Muldersvlei and Malmesbury and in these areas electricity was supplied to 130 farms. In Natal distribution networks were extended to connect up consumers on an additional 36 farms, while in the area served by the Rand and Orange Free State undertaking the number of farms supplied increased from 129 to 161.

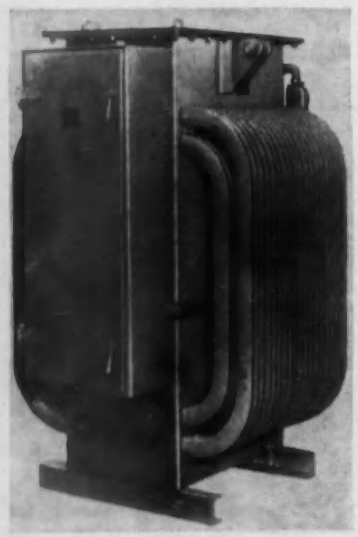
Growth of load and the development of the new power stations and transmission lines have brought about conditions in which important saving in capital and working costs could be secured by the "Pooling" of generation in certain of the Commission's undertakings, namely the Eastern Transvaal undertaking (formerly the Witbank undertaking) whose output has been pooled with that of the Rand undertaking and the Natal Southern undertaking (formerly the Durban undertaking) which has been pooled with the Natal Central undertaking. In this instance it is calculated that the pooling of generation in these two undertakings will result in a saving of about £4¼m during the next five years. A similar arrangement has been made in the case of the Commission's Central power station at Kimberley and the Vierfontein station, and after Sept. 1958 power will be drawn from the Vierfontein station to meet the growth of load on the Cape Northern undertaking.

Turning to financial matters, capital expenditure during the year amounted to £25·09m. Total revenue from sales of electricity reached £18·5m—an increase of over 19%. But production costs were also up by 18·5% to £18·4m giving a balance of only £84,243. This follows the surplus of £931 for the previous year. Coal, of course, was largely responsible for the higher production costs, accounting for £5·6m in expenditure—an increase of 14·8%—while transport charges also jumped by nearly 23%. Altogether, the Commission's power stations consumed 8,819,715 tons of fuel during the year, compared with 8,150,339 tons in the previous year.

Equipment for Industry

Selenium Rectifiers for Cathodic Protection

READERS will recall last May's issue of the ELECTRICAL TIMES in which a special section was devoted to cathodic protection. A concern normally associated with mercury vapour rectifiers, HACKBRIDGE AND HEWITTIC ELECTRIC CO., LTD., Walton-on-Thames, Surrey, now is supplying cathodic protective equipment incorporating selenium rectifiers. The protective units are constructed according to a basic design, but ratings and general electrical design may be arranged to suit individual requirements. Voltage control may be provided either by transformer tapping switches or voltage regulating transformer. A typical installation supplied for the cathodic protection of an oil pipe line in the Middle East, provides a d.c. supply of up to 80 amps, 6-60 V at a maximum ambient temperature of 55° C. The rectifier stacks and regulating transformer are immersed in a weatherproof tank for outdoor service, the operating handwheel for the regulating transformer together with measuring instruments and terminals are enclosed in a lockable box to prevent unauthorised interference.



This particular equipment will afford cathodic protection for an oil pipe line

Bi-metal Supplies

THE establishment of a new division by BRITISH DRIVER-HARRIS CO., LTD., Manchester, will be of particular interest to users of thermostatic bi-metal. After investigating process techniques and production quality control methods in collaboration with an American concern, the company can now supply thermostatic bi-metal for a wide range of industrial and domestic applications. Available in all the standard types, the material also can be supplied in sizes to meet individual requirements.

Wardle's "Diakon" Refractor

AS illustrated at this year's A.P.L.E. Conference Exhibition, the application of "Diakon" transparent moulding material to street lighting lantern manufacture now permits refractors of high optical accuracy to be fabricated by injection moulding techniques with a considerable saving in costs. The latest firm to employ this new material is the

The "Dielikon" refractor unit contains sealed internal prisms

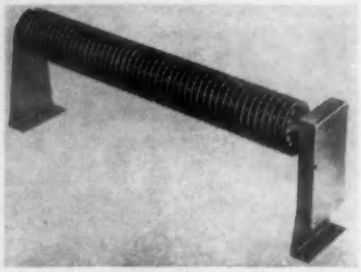
WARDLE ENGINEERING CO., LTD., Elsinore Rd, Old Trafford, Manchester 16, who recently announced the production of their "Dielikon" refractor unit claimed to be the first "Diakon" moulded refractor to have sealed internal prisms. Designed for Group B installations, the refractor is suitable for use with G.C.S. lamps up to 200 W and MB/V or MBF/V mercury vapour lamps up to 125 W. Having sealed internal prisms, the refractor thus presents a smooth internal surface to facilitate cleaning, whilst dust and dirt is, of course, kept out of the refractory surfaces themselves. Apart from its production advantages, "Diakon" offers good weathering properties together with light weight and considerable strength.

Extended Junction Box Range

INTENDED primarily for use in telephone and similar signalling systems, the new light current junction boxes manufactured by COMMUNICATIONS SYSTEMS LTD., 8 Arundel St, W.C.2, are compact in design and available in five sizes from 15 to 78 way. Sufficient room has been allowed to facilitate arrangement of the cables when formed and laced in accordance with normal telephone practice. Cable entries fitted with rubber grommets have been provided at each end of the box. Secured by trapped fixing screws, the lids have designation labels printed inside, enabling particulars of lines connected to various terminals to be recorded.

New Finned Tube Heater

SUITABLE for industrial ovens and drying rooms where temperatures of 200-350° F are required, the finned tube heater developed by the GENERAL ELECTRIC CO., LTD., Kingsway, W.C.2, com-



A high rating with a large surface area is offered by G.E.C.'s new oven heater

bines a high rating with a large surface area. A mild steel tube with a crimped gill of 4 in. outside diameter houses a withdrawable spiral element mounted on insulators which are assembled on a metal runner. For supply connections, a mild steel connecting box with a bracket for conduit entry is provided at one end of the heater.

Special Stitch Welder

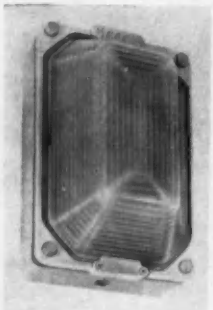
SPECIFICALLY designed for stitch welding spring cup pressings to automobile suspension assemblies, the S.A.M.75 becomes the latest addition to the wide range of welding equipment offered by SCIAKY ELECTRIC WELDING MACHINES LTD., Farnham Rd, Slough, Bucks. Basically, the new unit comprises two spot welding machines nominally rated at 75 kVA and mounted on a common bore plate. Each spot welder has an automatic indexing head designed to rotate the top electrode around the flanges of the two spring cups. These indexing heads may be adjusted to accommodate welds of varying pitch and speeds. Cylinder assemblies of the "hi-lift" retraction type allow pressings to be easily placed over the bottom dies, on depressing push button controls, the top electrodes descend to the stitch weld position.

Polyethylene Resins and Compounds

TWO polyethylene resins and two derivative polyethylene compounds are now being marketed by BAKELITE LTD., 12-18 Grosvenor Gdns., S.W.1. Resin DYNH, a general purpose material and compound DE—2400 designed for high quality injection moulding. The other two grades are resin DYNF and compound DE—2300 suitable for extrusion lamination or injection moulding.

G.E.C. Introduce Rectangular Bulkhead Fittings

DESIGNED to house a 200 W lamp the new rectangular bulkhead fitting developed by the GENERAL ELECTRIC CO., LTD., Magnet Hse, Kingsway, W.C.2, is an extension of the company's range of bulkhead fittings and weighs 18½ lb. It is constructed of cast iron and has a prismatic glass cemented into the front glass frame. This frame is sealed to the body of the unit by a gasket whilst a polished aluminium internal reflector with a porcelain e.s. lampholder is provided. There are three tapped ¾ in. E.T. entries for through or back entry to the unit and plugs are supplied for two of the entries when they are not in use. The unit (F.64032) measures 11¼ in. in length and has a width of 7¼ in. It is finished in light grey stove enamel. Price complete is £5. 10s., a spare glass costs £1 and spare gaskets are 5s. each.



Spare glasses are available for this new fitting

Stylish new radiator from Falco

AN attractive and stoutly constructed electric radiator has recently been added to the range of products marketed by FALCO ELECTRICAL APPLIANCES LTD, Audenshaw, Manchester.

Measuring 24 in. long x 18 in. high x 6½ in. deep and available in pleasant cream, gold, green or blue stove enamel, this new No. 206 radiator can be used with absolute safety in nurseries, bedrooms, halls and kitchens, and, say the firm, it is particularly useful for drying clothes. Its loading is one kW and the price £8. 11s. 11d. (inc. new rate of tax).

This stylish radiator is available in cream, gold, green or blue

This pillowspeaker has just been introduced by Rediffusion

Pillowspeaker for Hospitals

DESIGN of a new "pillow" loudspeaker for use in conjunction with hospital broadcasting services is announced by CENTRAL REDIFFUSION SERVICES LTD., Carlton Hse, Lower Regent St, S.W.1. This type of loudspeaker is for use by patients who are unable to sit up or wear conventional headphones. It is laid on the pillow near the head or maybe placed beneath the pillow. The designers claim that the volume is sufficient only for the patient who is listening.

1956 Frigidaire Range

BOLD styling is the theme in the production of their 1956 range, say FRIGIDAIRE DIVISION of General Motors, Stag Lane, Kingsbury, N.W.9.

New ideas in storage and convenience have been incorporated in slick cabinets which are available in radiant and pastel contemporary colour combinations both inside and out.

Completely new to the 1956 range is the de Luxe DT.44 model; this is a luxury "family" refrigerator offering 4·4 cu ft of storage space, more than eight sq ft of shelf area, a large "super-freezer," a roomy butter compartment, door shelves, an interior light, a full width hydrator, and sturdy acid-resistant porcelain-on-steel work table top. Yet all this is packed into dimensions of 2¼ in. x 25¾ in. x 39 in. This DT.44 is equipped with a unique ice-cube tray, producing 36 cocktail-size "cubelets" at a freezing. Like the other Frigidaire exclusive "Quickube" ice trays it has a gold anodised finish and a finger-touch lever action to release cubes.

The new DT 44 graces the 1956 Frigidaire range

The remainder of the seven 1956 Frigidaire models range through five sizes from a standard 4·3 cu ft "family" model to two large de luxe models ODT.79 and ODT.98. Prices range from 69 gns. to 182 gns. The ST.43 and MT.44, smaller models, are available in white and cream, the others also being in 6 bold colours.

For the Electrical Trade

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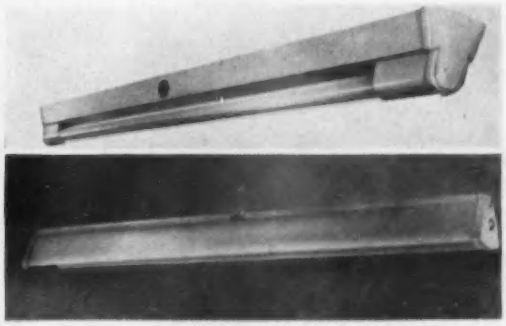
New Atlas "Popular" Pack Sizes

A YEAR ago the Atlas "Popular" Pack was introduced to the trade—the first say THORN ELECTRICAL INDUSTRIES LTD., 105 Judd St, W.C.1, 5 ft 80 W fluorescent fitting to be marketed complete with control gear and Atlas "White" tube at less than five pounds. The success of this idea has now led to the introduction of Atlas "Popular" Packs in 4 ft 40 W and 2 ft 20 W sizes.

These are high quality fittings, each boxed singly complete with control gear and Atlas "White" tube, ready for immediate installation from any ceiling point. Prices of the new fittings are as attractive as for the 5 ft 80 W sizes:

5 ft 80 W	...	£4. 19s. 8d. inc. tax
4 ft 40 W	...	£4. 7s. 2d. inc. tax
2 ft 20 W	...	£3. 15s. 2d. inc. tax

At the same time, the basic Atlas "Popular" design has been improved by new plastic endcaps. In addition a number of diffuser and reflector attachments are available in "Perspex," the prices of the latter ranging from 12s. 6d., single side, to £6. 10s. opal, while the diffuser costs £2. 16s. 1d. to £4. 7s. 10d.



The plastic end caps on the new models are evident in this photograph. One of the ADO type louvres is shown in the lower photograph

Prices and the Budget

NOTIFICATIONS of price increases following the Chancellor's announcement of new purchase tax rates received this week include the following:

The CARRON CO., Carron, Falkirk, announces new prices:

Sirius 1 kW fire now £3. 1s. 2d.; 2 kW £4. 17s. 1d.
Cursey 1 kW fire now £3. 1s. 2d.; 2 kW £4. 8s. 6d.
Pedestal 1 kW fire now £4. 4s. 11d.; 2 kW £5. 14s. 5d.

The 2½ kW "Sunglo" all-chromium fire now costs £12. 7s. 6d.

HURSEAL LTD., 229 Regent St, W.1, heaters. This company has issued emergency price list giving new prices to be read in conjunction with their public and retailers' price lists. They have decided to absorb the increased purchase tax on the Hurseal Minor, the Model C wall radiator and their electric convector and the price of these items including purchase tax remains virtually the same. In order to offset the effect of increased tax on sales Hurseal Ltd. have increased the retail discount on certain of their products so that with one exception a standard rate of discount prevails.

PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Ave, W.C.2, announce new price structures:

"Philishave" mains model shaver ...	List £6. 4s. 11d.	
	P.T. £1. 9s. 3d.	
		£7. 14s. 2d.
"Philishave" battery model shaver ...	List £8. 3s. 1d.	
	P.T. £2. 1s. 11d.	
		£10. 5s. 0d.
"Infraphil" standard model infra-red lamp	List £3. 16s. 9d.	
	P.T. £1. 13s. 9d.	
		£5. 10s. 6d.

CHILTON ELECTRIC PRODUCTS LTD., Hungerford, Berks, announce that the gross retail price of the Buk Shaver and Pigrex case is now £5. 17s. 4d. The KUB shaver and case now costs £4. 2s. 5d. gross retail (i.e. inc. tax), the BUK shaver head £1. 4s. 9d. gross retail and the KUB shaver head gross retail price £7. 3s. 6d.

PARNALL (YATE) LTD. announce prices for their range of laundry equipment as follows:

Parnall EW50 washing machine £68. 13s. 0d. Tax paid

The price of Falks Stadelmann's "Sleepwarmer" safety blanket which was reviewed in this column in our 28th October issue has now been amended to include increased purchase tax. Price is now £5 10s. plus £1. 4s. 2d. p. tax

Parnall EW50H washing machine £79. 14s. 6d. Tax paid
Parnall "Ezy Press" washing machine £30. 9s. 0d. Tax paid
Thor "Automagic" washer £98. 12s. 0d. Tax paid
Thor dishwashing attachment £25. 2s. 3d. Tax paid

H.M.V. HOUSEHOLD APPLIANCES give prices effective from 27 Oct. (following the Chancellor's announcement):

I.C.10 Milady's iron, a.c. version, £2. 8s. 6d. inc. tax
I.C.10 Milady's iron, a.c./d.c. version, £2. 12s. 6d. inc. tax
I.C.2 Iron stand 6s. 9d.
F.1 "Ely" fire £4 2s. 6d.
F.3 Lincoln fire 3 kW £9. 19s. 6d.
2/F.3 Lincoln fire 2 kW £9. 19s. 6d.
H.C.2. Cavendish room heater £11. 19s. 6d.

THE GENERAL ELECTRIC CO., LTD., Magnet Hse, Kingsway, W.C.2, announce new prices for their "Star and Candle" set £1. 13s. 4d. plus 7s. 4d. p. tax. The "Standard" set costs 16s. 11d. plus 3s. 9d. p. tax, the "Party light" set £1. 5s. 0d. plus 5s. 6d. The "Large Bulb" set £1. 8s. 3d. plus 6s. 3d.

TRADE PUBLICATIONS

VACUUM EQUIPMENT.—Several new leaflets issued by Edwards High Vacuum Ltd., Manor Royal, Crawley, Sussex, to supplement their catalogue on vacuum equipment include B.153/1 which describes the "Philani" gauge; D.141/4 describing the Model 3 Domsalion gauge control and the range of gauge heads as a reissue of gauge summary D.111/2; reprints of leaflets C.107/4, C.104/1, C.111/4 and C.100/5 and new leaflets E.108/4 and E.101/5 describing the small 6E and 12E vacuum coaling units.

RADIO COMMUNICATION.—Redifon Ltd., Broomhill Rd, S.W.18, have issued a brochure describing their Type G.R.250 short-wave transmitter receiver.

RADIO COMMUNICATION.—High quality 12 W amplifier B.C.5 2418 is described in new booklet issued by the General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

BATTERIES.—Chloride Batteries Ltd., Clifton Junction, near Manchester, have published a new book "Batteries Are Our Business" in which they attempt to describe the resources of their organisation in the fields of research, design, manufacture and distribution.

THE BRITISH CENTRAL ELECTRICAL CO., LTD., 6 and 8 Rosebery Ave, E.C.1, announces that the Addenda No. 2 is now available for use with their latest 256 page catalogue of industrial electrical equipment. This is being distributed automatically to all persons holding copies of the catalogue.

SWITCHGEAR, ETC.—The second issue of the complete list of standard products which bear their name and mark has now been issued as catalogue 155/55 by Wm. Sanders and Co. (Wednesbury), Ltd., Wednesbury, Staffs. It supersedes and cancels all previous issues.

ACCESSORIES.—Temco electrical accessories 1955-1956 catalogue has now been issued by T.M.C.-Harwell (Sales) Ltd., 37 Upper Berkeley St, W.1.

CABLES.—New folder card P.2578/6 issued by Falk Stadelmann and Co., Ltd., 91 Farringdon Rd, London, E.C.1, gives prices for "Hitest" flexible cables and wires both rubber and thermoplastic (p.v.c. and polythene) insulated.

LIGHTING.—New lighting sales aids available from Linolite Ltd., 118 Baker St, London, W.1, include leaflet 23a which illustrates the range of fittings and Linoglas signs. Leaflets 21 and 22 which have been produced to assist the public as to the uses of Linolite and a sales aid sheet which shows the range of five portable display boards, showing a variety of popular fittings so that they can be illuminated. The MHC clip-on mirror light showcard is again available.

HEATERS.—Striking two-colour handbill leaflets No. 38 have been issued by Key-Leather Co., Ltd., 5 Urswick Rd, E.9, describing their K-L fan heater and ventilator.

LAMPS.—New 40-page catalogue of current lamps and lighting equipment has been published by the Stella Lamp Co., Ltd., 37-39 Oxford St, W.1.

INSTRUMENTS.—Counting Instruments Ltd., Elstree Way, Boreham Wood, Hertfordshire, have issued a new catalogue of mechanical and electromagnetic counters.

WELDING.—The Argon-Arc process of welding aluminium and its alloys is being described in a series of booklets issued by the British Welding Research Association, 29 Park Cresc, W.1. It is in five parts; the first just issued deals with the principles. Other parts to follow will be concerned with electrical characteristics, metallurgical considerations, design applications and costs, and finally, techniques and procedures. First of the series costs 2s. 6d.

FANS.—Woods of Colchester Ltd., Braiswich Woods, Colchester, Essex, have issued a new Aerofoil for publication.

X-RAY EQUIPMENT.—The Monarch X-ray diagnostic table just introduced by Newton Victor Ltd., Department of Metropolitan-Vickers Electrical Co., Ltd., 132 Long Acre, W.C.2, is the subject of a booklet just issued by the company.

CABLES.—Enfield flexible welding cables are described in publication E.N.201, issued by Enfield Cables Ltd., Victoria Hse, Southampton Row, W.C.1.

RECORDERS.—Sheet No. 323, published by the Cambridge Instrument Co., Ltd., 13 Grosvenor Place, London, S.W.1, describes the Cambridge Dissolved Oxygen Recorder (of the electro-chemical type).

HEAT TREATMENT.—Furnaces for Carbonitriding are described in detail in a new brochure by Wild-Barfield Electric Furnaces Ltd., Elecfurn Works, Otterspool Way, Watford.

PROBLEMS AND PRACTICE

In Engineering

Reversed Winding

I AM sorry that my observations on the above subject have proved to be of no avail to your contributor A. R. (27 Oct. issue). If, as stated, everything else in both starter and motor were correct (other than the reversed series winding) then I am really at a loss to account for the overheating of the n.v.r. coil. Under the circumstances I look forward with interest to reading other contributors' views on this subject. In the meantime I would suggest that A. R. experiments by reverting to the original connections of the motor and try the starter once more. If the series windings alone were responsible for the overheating of the n.v.r. coil then this coil should again overheat. If on the other hand it does not overheat then other factors come into operation of which apparently he is at present unaware.—*E. A. Robbins.*

Mechanical or Electrical?

WITH direct coupled or geared motors, a mechanical fault such as a loose impeller or seized shaft can cause a certain amount of friction between the electrical and mechanical crews. Symptoms such as a roar and no movement from the motor when switching on seem to point to an electrical fault but even on the electrician testing, and proving, to his own satisfaction at least, that the electrical end is sound very often the only way to demonstrate it to the mechanical crew is to disengage the motor and run it light. This can be a major operation and as far as the electrician is concerned, unnecessary.

A case in mind concerned a 55 h.p. s.c. centrifugal pump running at 1,450 r.p.m. This machine had been working satisfactory for weeks and suddenly the switch tripped. Both the inspection electrician and fitter were called and the motor was found to be hot while the coupling could be turned easily by hand. The motor was tested for insulation which proved to be sound. The resistance of the three phases were checked and found to agree, which showed there was no winding short-circuit. The switch was proved to be in good order and the motor was getting a supply on all three phases. All this proved almost conclusively that the motor was in order. The next step was to start the machine.

On starting the ammeter showed a heavy overload and the motor noises appeared to indicate single phasing. However, as all tests had shown that this was not the case the electrician blamed the pump, turning the impeller shaft by hand to demonstrate that it was free. The only thing then left was to pull back the motor and run it light showing that the electrical side was satisfactory. After such proof the fitter decided to remove the end plate from the pump and found the impeller loose on the shaft. While free to turn by hand, at speed it rubbed heavily against the end plate. On locking the impeller, the pump worked satisfactorily again.

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

A similar case occurred on an outside crane. This was a 30 h.p. slipring, totally enclosed motor and had only two outer feet, the front shield being flanged on to the gearbox of the hoist drums. This motor showed the same symptoms but was a most awkward motor to remove as there was very little working space and no way of managing a chain block. It weighed about a ton. The trouble here was eventually traced to a seized drum which fortunately was discovered before the motor was removed, which would have been a fruitless job.

However, great care has to be exercised in testing because sometimes an unusual fault does crop up which might not show up on instruments. One such case was the connection between the rotor winding and a slipring. This motor also made a strange noise on attempting to run. The fault was discovered on spotting a flash in the rotor. Putting pressure on the vertical connection showed up the break.

Another unusual incident occurred in a battery of centrifugals, this particular machine being slow to pick up speed. The ammeter showed a normal starting load but dropped back very slowly to normal load as if it were overloaded even though it was running empty. These centrifugals were driven by 50 h.p. slipring motors through friction clutches which allowed the motor to reach full speed instantly and brought the bucket to full speed in a matter of 60 secs. or so. The air cooled resistance was always in circuit.

Usually, trouble here was caused by either the lining of the clutch shoes being worn off or else the new lining gripping too well, or a broken resistance grid in the rotor circuit, the latter nearly always betraying itself by sending out a shower of sparks. In this particular case, however, it turned out to be a wrong internal connection in the resistance which cut out one bank of the three-phase motor resistance. This being the first case of such a fault some time was lost in locating it, which not only shows that there is always a first time but that familiar symptoms can easily be misleading.—*C. B.*

Starter Fault

RECENTLY, a 5 h.p. motor had been installed to drive a circular saw and repeated trouble was experienced at starting due to the circuit fuses blowing. The starter was a hand-operated star-delta type with the moving contacts on a centre spindle. The installation had been thoroughly checked by the contractor responsible for wiring and a further check confirmed that the connections were satisfactory and there was no earth on the installation.

When the starter cover was removed the motor started satisfactorily and also carried load without any blowing of the fuses. This gave the clue that the fitting of the starter cover must be partly responsible for the trouble and indeed this was the case. During the wiring up a bare copper bridge piece, linking two of the fixed contacts, had been pulled forward and when the starter was operated this lifted very slightly still further sufficiently to touch the starter cover thus accounting for the earth when the starter was operated. The connecting link was pushed back and the motor and starter then operated satisfactorily.—*"Torque."*

Dim View

A COMPLAINT was received from a consumer that the kitchen light was glowing faintly, also that this light could not be switched off.

On arrival it was found that the lamp, of 60 W, was certainly glowing, but not to its full brilliance. However, on further investigation it was found that the light drop was wired to a three plate moulded ceiling rose. On taking the ceiling rose down, it was found that the live terminal and the switch wire terminal had tracked across the moulding, therefore completing the switch circuit, which, although of high resistance, was allowing sufficient current to allow the lamp to glow slightly.

It was found out later that the reason for the tracking behind the ceiling rose was due to the consumer who had been scrubbing the back bedroom floor over the kitchen. It seems that water had run between the floor boards through the ceiling and had entered the back of the ceiling rose, therefore making a path for the current to leak across the live and switch wire terminals which eventually burnt into the moulding leaving a carbon track. After replacing the ceiling rose with a new one, and warning the consumer not to be so free with the water on the floor in future, everything was in order.—*A. Dearden.*

NEWS OF THE WEEK

New Campaign for Fuel Efficiency

Govt Plans to cope with Remote Risk of Fuel Crisis

PLANS to protect power stations and other important national interests in the event of any risk of a fuel crisis this winter have been made by the Government. Mr Geoffrey Lloyd, Minister of Fuel and Power, said last week that on the whole the risk of a fuel crisis was slight, but it was thought wise to take industry into the Government's confidence at the beginning of winter. Accordingly, the Minister met representatives of the F.B.I., the N.U.M., the British Employers' Confederation, the Association of British Chambers of Commerce, the C.E.A., Gas Council, Transport Commission, Regional Boards for Industry and the T.U.C. At 19 million tons, stocks of coal were probably the highest ever, Mr Lloyd told them, but this was due to the warm weather and imports and not better output from deep mines, so that there was no room for complacency. If the winter proved severe, the country would still be all right if output recovered from its present disappointing level.

Mr Lloyd went on to announce that the National Industrial Fuel Efficiency Service was launching a fresh and vigorous campaign for fuel economy in industry. N.I.F.E.S. are to write to 25,000 industrialists urging them to reduce their fuel consumption by 10%. The aim was to get management to re-examine their coal consuming and economising arrangements.

It will be recalled that we reported in our 27 Oct. issue, that regional boards for industry are inquiring into apparent reticence on the part of industrialists to take steps to economise in fuel. The investigation is being carried out at the request of the Ministry.

Dr W. A. Macfarlane, chief executive of N.I.F.E.S., commented that in the main factories could economise most easily on space heating. He said about half industrial consumption of fuel during the winter was used for space heating; it was often possible to reduce waste in that field.

Big Fire at Indian Industries Fair

ONE of the firms who suffered most in a fire which broke out during the Indian Industries Fair in New Delhi was the British Automatic Telephone and Electric Co., Ltd. The company stated last week that many thousands of pounds' worth of telecommunication equipment was lost when the fire broke out and completely destroyed one of the large trade pavilions. Automatic Telephone had one of the largest individual British exhibits at the Fair, occupying some 4,000 sq ft and costing about £100,000 to produce. The outbreak is reported to have started after the Fair closed for the day in a part of the building occupied by Rumanian exhibitors. It quickly spread to other stands but the main British pavilion, some distance away, was not affected.

Ladies' Night

SATURDAY, 10 Dec., is the date of this season's A.S.E.E. Ladies' Night which will be held at the Park Lane Hotel, Piccadilly. There will be dinner, dancing, buffet refreshments and cabaret. Guest of honour will be the Dowager Lady Swaythling. Early application for tickets is advised, and these may be obtained from the Association's general secretary at 23 Bloomsbury Sq, W.C.1.

Monopolies Reference on Common Prices and Tendering

THE last two of six references announced by the President of the Board of Trade in the House of Commons on 16 June, have now been submitted to the Monopolies Commission. One of the references concerns common prices and collusive tendering, which will have some bearing on more than one aspect of the electrical industry. The Commission is to examine the general effect on the public interest of agreements and arrangements among suppliers which restrict or limit competition in the prices at which they supply, offer to supply, or tender to supply goods.

This may well provoke some local authorities to renew their complaints, made earlier this year, concerning the submission of identical tenders for street lighting installations. On a number of occasions public lighting authorities have asked the Board of Trade to forward their complaint to the Commission and a reference on the supply of street lighting fittings was forwarded to the Commission in June. Numerous other products and services are involved. Collusive tendering will form only one aspect of the inquiry but it will probably receive most attention.

Persons or organisations wishing to offer evidence are invited to contact the Commission's secretary at 8 Cornwall Terr, Regent's Park, London, N.W.1.

E.D.A. Film on Ring-Circuit Wiring

AMONG the latest of the longer films produced by the E.D.A. is one describing the advantages of the ring-circuit system of wiring. Designed to appeal to a wide audience the film describes the story of some newly-weds who have temporarily to live in a "one socket-outlet/room" house with their in-laws, and who discover through bitter experience that although electrical wedding presents are ideal for labour saving and entertainment, they need wiring and facilities adequate to carry the load. The architect designing their new house introduces them to the ring-circuit, and gives a practical demonstration of its use, with an electricity board representative. Three short attractive and humorous advertising films are "Bath for a Bride," with Sally Anne Howes, "Switch in the Kitchen," with Cicely Courtneidge, and "Jack's Conversion," with Jack Hulbert. These use a combined cartoon and "live" technique.

The E.D.A. programme for 1956 includes plans for films on the home laundry, industrial lighting, industrial heating, commercial cooking and horticultural and agricultural topics.

Leeds E.A.W. to stage Public Exhibition

LEEDS branch of the E.A.W. are following the example of their southern sisters and organising an exhibition on "Electricity in the Home." It will take place at the Paisley Hall next week (15, 16 and 17 Nov.) and will be opened by the Lord Mayor of Leeds, Ald Sir James Croysdale. Lady Croysdale is the branch president as well as Lady Mayoress. It will be recalled that members of the Association have organised similar very successful exhibitions at Lewisham and Woolwich in the past, but the Leeds show is the first of its kind in the north. Five companies besides the C.E.A. and Yorkshire Electricity Board will be co-operating with the E.A.W. to stage the exhibition. They are the British Thomson-Houston Co., Electrolux, Ferranti, Hotpoint and Modern Electrical Industries. In addition to displays and demonstrations, there is to be a full programme of lectures (about 16 in all) and films covering various types of appliances and many aspects of the electrical industry.

Experiments in TV Advertising

THE illustration accompanying this paragraph shows a scene from Crompton Parkinson's new television filmlet featuring the company's lamps. The film is one of a series on Crompton lamps and batteries which have been screened at almost weekly intervals since commercial T.V. started. Earlier films in the series have all been of the animated cartoon type, but the new live action film has been produced to try and discover public preference for one or other of the presentations. Crompton are planning to run a further series on the Midlands service when it opens early next year. Parts in the new film are played by John Baxter and Patricia Webb.

TUESDAY ITV SPOTS

THE Philishave dry shaver is featured in a 60-second film to be transmitted on ITV at peak view times every Tuesday evening. Two films have been produced for screening on alternate Tuesdays. Both of them have the shaver's rotary action as the main theme.

Three Deaths caused by Electric Blankets or Pads

THREE inquests took place in Yorkshire last week following deaths resulting from the use of electric blankets or warming pads. At Halifax a verdict of death by misadventure was recorded on a man found lying on an electric blanket. The blanket had been laid on the mattress, and over it were two woollen blankets, whilst three blankets, an eiderdown and a bedspread covered him. It was thought at first that the man had died of natural causes, but a doctor found burns. When the electric blanket was tested there were two thermostats and no signs of overheating. In similar conditions the temperature rose from 62°F to 156°F, the thermostats not having worked at all. Immersed in boiling water one thermostat operated at 250°F and the other slightly higher instead of the normal 145°.

A second inquest at Halifax concerned a 4-day-old premature baby fatally burned at Halifax General Hospital by an electric warming pad placed in, instead of on, the cot. The coroner stressed that instruction should be given to all nurses on the use of pads, and urged periodic inspection. In evidence about tests on the pad after the accident, it was stated that the built-in thermostat should have cut at 130°F, but in fact they cut at about 185°. The coroner recorded a verdict of accidental death and asked for greater precautions in the use of such appliances in hospitals.

A 4-day-old baby was also involved in an inquest at Otley. The baby died of burns, having been left for five hours in an electrically heated and thermostatically controlled cot at the General Hospital. Tests on the appliance showed that the temperature did not rise very high for a comparatively short time, but when the equipment had been on for a long period, it rose much higher. After half an hour the temperature was 92° F, after an hour 103° and after two hours 110°. The coroner commented that the instructions received with the appliance were inadequate and did not give sufficient explanation. A verdict of death by misadventure was returned.

OFFICIAL PUBLICATIONS

E.R.A. REPORTS

L/T316: Polarization of Dielectrics by Slow Particles, III, by H. Pelzer, 7s. 10d.; O/T15: Failures of Earth Wires on 33 kV Overhead Line System, by F. Busemann, 6s. 3d.; Q/T123: Design of High-Voltage Stress-Controlled Condenser-Type Bushings and Capacitors, by S. Silbermann, 30s. 4d.; Q/T123a: Design of High-Voltage Stress Controlled Condenser-Type Bushings and Capacitors, Concise Report, 18s. 3d.; V/T119: Performance of Joints in Steel and Non-Ferrous Conduit and Fittings (excluding Copper), by L. Gosland, 18s. 3d.; Z/T96: Investigation of Deterioration of Moulded Carbon Resistors: Second Report, by J. J. Walsh and H. F. Church, 12s. 10d.; O/T17: Prevention and Remedial Treatment of Premature Decay in Creosoted Baltic Redwood Poles, by D. N. Smith, 9s. 3d.; and O/T18: German Experience on Preservation of Wood Poles, by D. N. Smith, 9s. 3d.

SAFETY IN MINES RESEARCH. 33rd annual report for 1954. H.M.S.O., 4s. (See page 714).

MINES. Report of H.M. Inspector for W. Midland and Southern Div. for 1954. H.M.S.O., 2s.

CENSUS OF PRODUCTION, 1951: Batteries and Accumulators (Vol. 4, Trade N.). H.M.S.O., 1s. 6d.

U.K. ATOMIC ENERGY AUTHORITY. First annual report up to 31 Mar., 1955. H.M.S.O., 2s. (See page 710.)

SCIENCE AND TECHNOLOGY IN W. GERMANY. Published for D.S.I.R. by H.M.S.O., 4s. (See page 720.)

N.C.B. SPECIFICATION No. P.130/1955: Intrinsically Safe Remote Control Circuits when associated with restrained plugs and sockets. Available from N.C.B., Hobert Hse, Grosvenor Place, S.W.1, price 3d.

RURAL ELECTRIFICATION: Utilisation of U.V. Rays in Agriculture. Published by U.N. Economic Commission for Europe.

Pottery Craft for New Range of Table Lamps

IN these days of mass production it is usually refreshing to learn of the employment of craftsmen in the manufacture of goods. One such instance is provided by the General Electric Co.'s approach to Alan Brough of the Deacon Pottery, a master potter, with the request that he execute the prototype bases of some newly designed table lamps in pottery. This he did successfully and rather than spoil the effect by using mass production techniques, the company asked him to make bases for a new range of table standards on his self-built throwing wheel. Table lamps employing these bases are expected to be in the shops shortly.

For this latest commission, Alan Brough uses only Cornish china clay and oxides of mineral virgin for colour. He prospects for his own minerals, many of which he finds in old Roman copper and iron mines in Cheshire. Processes of "manufacture" are of course long and intricate. After fashioning, drying out and turning of the product takes ten days, by which time, after glazing and fettling, it is ready for firing at 1100° C. Staking his electric kiln takes another day to ensure proper circulation of air between articles, not one of which must be touching another.

£3½m ATOMIC ORDER

THE Mitchell Construction Co., Ltd., have been awarded a £3½m contract by the U.K. Atomic Energy Authority for the civil engineering work on the new nuclear power station at Chapel Cross, Annan, Dumfriesshire. Work will begin next month and is expected to take 3½ years. Consulting engineers are Merz and McLellan.

1955-56 Beama Catalogue has Over 1000 Pages

THE third edition of the now world-famous BEAMA Catalogue is published this week. Bound in a style similar to its predecessors, it contains over a thousand pages, each packed with details of some aspect of the British electrical industry or of a particular company. The volume is divided into seven sections, the first three being devoted to indiivdual firms (in alphabetical order) concerned with the manufacture of power plant; equipment for industry, transport and communications; and domestic and commercial appliances. It also includes a Buyers Guide and a Trade Directory. There are notes too in German, French, Spanish and Portuguese. In a foreword to this 1955-56 edition, Mr P. Thorneycroft, President of the Board of Trade, says the Catalogue's value lies not only in the part it will play in promoting exports, but also in the evidence provided of continuing achievements. The great range of machinery illustrated shows what the industry has to offer the world for the generation and peaceful utilisation of nuclear power, he adds. The catalogue is published by Iliffe Press Ltd.

Visitors to the Motor Show probably noticed the lighting installation on the stand of Simms Motor Units Ltd. Illumination was evenly diffused by a Lumenated Ceiling 15 ft wide, suspended over the front half of the stand and extending upwards to form a fascia. Lamp arrangement comprised 20 4 ft 40 W fluorescent tubes, parallel to the ceiling tracks, and 3 5 ft 80 W tubes in the curve

New Method of Co-operation between the Architect and Illuminating Engineer

SECOND of the 1955 series of Conferences for Architects on electric lighting took place at the Lighting Service Bureau recently. It was organised by E.L.M.A. and Mr J. M. Waldram was the principal speaker. Mr Waldram suggested a new method of tackling the lighting of a new building. Customarily, the problem had been attacked by starting with the lighting equipment and working out its effect. The new method was to start at the other end with a statement of what the lighting was required to achieve and working backwards. This, he said, enabled a project to be worked out on paper with some assurance of the result and without experiment, which was costly and often misleading.

Mr Waldram, in the course of his talk, said that if co-operation between engineer and architect was to succeed, there had to be some understandable means of communication between them. The first and simplest, was the Munsell or other system by which the architect could indicate the colours he would use. The second link concerned the modelling and flow of light. Conditions to produce known effects could be expressed photometrically, so that if a choice was made from photographs it was possible to express it numerically. The third link was that a scale of Apparent Brightness had been prepared, by which the architect could express the light and shade he required.

Later, replying to the discussion, Mr Waldram said the new method was so far known as Design Appearance Lighting. It was still too new to be in general use, he added, but hoped it would be soon. The discussion was introduced by Sir Howard Robertson who provoked a lively debate.

PHYSICISTS IN INDUSTRY

ADDRESSING the Stafford Works Engineering Society of the English Electric Co., Sir George P. Thomson spoke of the relationship of physicists and engineers in industry. The engineer was an artist who created designs, and the physicist a philosopher who wanted to find out why things happened. The most startling example of physicists' discoveries which now formed branches of engineering, was nuclear energy, he said. Discovery of fission was only 16 years old—never before had such an important revolution in technique occurred so quickly. By 1975, Sir George remarked, 40% of electric power would come from nuclear energy, replacing some 40 million tons of coal a year. Physicists should not be confined to research departments, and Sir George thought there should be more opportunities for technically trained men to take part in administration. He considered a five-day week unsuitable for a scientist because he could not forget a problem from Friday to Monday, and suggested a longer working week with longer holidays.

Company tackles Big Arrears of Orders

ABOUT 350 delegates representing wholesalers, contractors, and Electricity Boards attended the third annual sales conference of Dimplex Ltd. at the end of last month. One day was allotted to each of the three groups of delegates. The conference room was also an exhibition centre with a comprehensive display of the company's products on show. Mr E. J. Wade, managing director, referred to company's arrears in deliveries, and said they were now in their new factory at Millbrook, production was soaring, and the big back log of orders was being tackled vigorously.

MIMCO PRODUCTS DISPLAYED

A DISPLAY featuring a wide range of MIMCO sound reproducing equipment by Special Products Division of the Marconi International Marine Communication Co., Ltd., was on view last week in Marconi House, Strand, the site of the old 2LO broadcasting station.

A typical central control for a medium sized installation feeding up to 60 loudspeakers and able to select inputs from a broadcast receiver, a gramophone unit or tape-player by means of a rotary switch, was demonstrated. The "Pantenna" communal aerial system permitting the independent use of some eighty individual receivers from one common aerial, thus avoiding an unsightly array of personal aerials on board ship formed one of the major exhibits. This equipment also enables broadcast programmes to be be distributed to positions below decks where it would be impracticable to erect aerials. The apparatus is also suitable for similar systems in blocks of flats.

The First Half-Century

Methods of charging for electricity consumed have always proved a safe basis for prolonged and keen debate, but Mr W. R. Rawlings' suggestion will also be of interest to all meter makers and demand indicator men. He advocates nothing less than charge per kW demanded, not per kWh consumed, and his notion is thereby to encourage daylight use of current which must be paid for anyway. He would substitute, however, a maximum cut-out for a demand indicator, so that no one can take more than the agreed power, though he may take it all day and night if he so please. The analogy of water supply is cited in justification of this innovation, for which Mr Rawlings has a good deal to say.—*From our issue of 9 Nov., 1905.*

FLOODLIT MANOR

A new floodlighting installation at Chadwick Manor, which lies just half a mile off the main Birmingham-Warwick road, near Knowle, was switched on for the first time at the end of last month. The rear view of the Manor is shown here with tungsten lamps illuminating the main building and mercury lamps, the roof. Rowlands Electrical Accessories Ltd. say that the absence of any competitive lighting in the neighbourhood enabled them to achieve an even more remarkable effect, and with a comparatively small loading of 12 kW

Splendid Isolation

Attractively designed cover and cast iron case of the MEM Rotary Fused Isolator are finished in grey stove enamel.

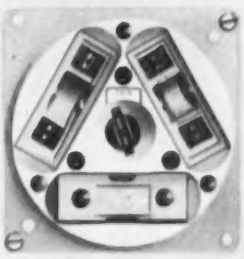
Handsome appearance and high efficiency go hand in hand here, in the MEM Rotary Fused Isolator.

Designed for use with A.C. Motors on machine tools and other similar applications, this switch is of a slow break A.C. pattern rated at 15 amps., 500 volts. It will safely disconnect a stalled motor of 7½ h.p. taking six to eight times full load current.

The unit takes 15 amp., rewirable " Kantark Major " fuses or alternatively you can choose standard H.R.C. fuse links to the dimensions of B.S.88 1952, Appendix J.

Fuses can be inspected or renewed in perfect safety. The cover can only be removed when the switch is in the ' off ' position, and then the fuse contacts are completely isolated from the incoming supply.

Two patterns are available, for flush or surface mounting.



Fuse inspection is absolutely safe. The fuse sockets are isolated by the removal of the cover and it is impossible to touch live metal.

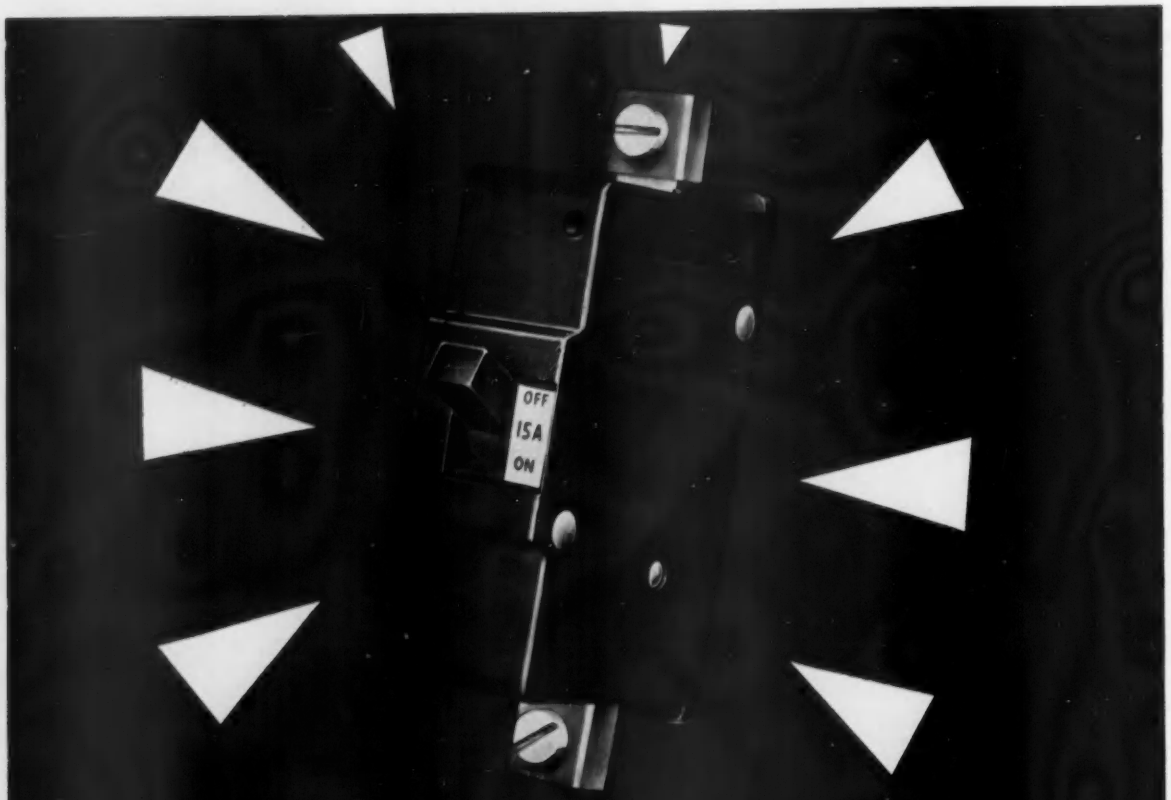
Wiring is especially easy. Heavy clamp terminals are provided and are clearly identified. An indicator shows whether the switch is on or off.

The three phases of the robust cam operated switch are separated by thick porcelain walls. Contacts are solid silver. Inspection is simple once the plastic switch cover is removed.

MEM

Send for illustrated leaflet

MIDLAND ELECTRIC MANUFACTURING COMPANY LIMITED · TYSELEY · BIRMINGHAM 11



LOADMASTER

DORMAN & SMITH LTD.

THE WORLD'S BEST L.T. SWITCHGEAR

A Distressing Budget, says Sub-Area Manager

THE most distressing thing he had ever heard, was the way in which Col A. E. Knights, manager of the Fens sub-area of the Eastern Electricity Board, described the Budget when he addressed last week's meeting of the Cambridgeshire Parish Council's Assoc. He was speaking on his plans to take electricity to isolated districts. The Chancellor thought only in terms of pounds, shillings and pence, he said, but he dealt with human beings. The Budget would mean smaller capital expenditure, which would force him either to sack some of his men, which he was not prepared to do, or that the men worked at a lower rate of productivity.

Outlining his rural development plans, Col Knights said the ultimate aim was to take electricity to 90% of premises in the Board's area. Stage one was to take a supply to all villages and hamlets without it. There were 171 of them in 1949 and it was estimated the job would take 10 years. Already, he went on, only 24 remained to be connected and they were mainly hamlets of five or six dwellings. The second stage involved doing the job of electrification in areas, and planning on that basis began four years ago. In the process of a major installation, Col Knights said, the maximum number of statutory consents they might have to obtain for a scheme was 83.

LIGHTMONGERS' DINNER

THIS year's annual dinner of the "Lightmongers," the society of the Lighting Industry whose object is social and charitable, lived up to the reputation which has already been established by this comparative newcomer to the ranks of electrical societies in previous years. Mr Tom Jones was installed as the new president, succeeding Mr Walter Veness. The speeches were mainly of commendable brevity and humour. Mr Harry Walker proposed the toast of "The Society," and Mr Henry Hall proposed the toast of "The Guests." The reply was made by Mr Ray Marks, of Australia, who was supported by Mr Guy Campbell. After the toast of "The President" had been proposed, by Mr Tom Jones, Mr Veness replied, thanking the Council for their aid during his term of office. He mentioned the work of Mr Vic Gardner, the secretary, who was unfortunately unable to be present, being in hospital with an infected leg. On behalf of the E.I.B.A., Mr A. Cannon, deputising for Mr Fothergill, accepted a cheque for £25 from the society.

Mr W. Veness investing the new President, Mr Tom Jones, with his badge of office

A.E.M.T. DINNER

THE Association of Electrical Machinery Trades held their annual dinner last Friday evening at the Savoy Hotel, London. Well over 200 members and guests enjoyed a programme which included a cabaret and dancing until 1 a.m. The evening was probably made the more enjoyable by the short toast list. The Association's chairman, Mr F. H. Washington, proposed the toast of the Guests, and Mr G. F. Peirson, chief engineer of M.E.B., replied, and ended the formalities.

Mr G. F. Peirson speaking at the A.E.M.T.'s annual dinner. On his right are Mr and Mrs F. H. Washington

BIG CAMPAIGN TO BOOST SHAVER SALES

MINDFUL of the increasing demand for electric dry shavers and their potentialities as Christmas presents, Remington are shortly to launch a full-scale national advertising campaign with the slogan, "This Christmas the Gift Word is Remington." As the Christmas shopping spree begins, space is to be taken in national newspapers and magazines, which they say, have a total circulation of 170m. Extra boosts will be given to the campaign by weekly one-minute spots at peak times on commercial television, and by short colour films in 800 cinemas. Free stereos are available to retailers for local Press advertisements, and also two attractive showcards in the shape of Christmas trees and bearing appropriate information and messages.

NEWS IN BRIEF

Annual Court of Governors of the Commercial Travellers' Benevolent Institution will be held at Berners Hotel, Berners St, London, W.1, on 31 Dec. at 12 noon.

Second annual dinner of the Ediswan (London and District Offices) Long Service Assoc. will be held at the Horse Shoe Hotel in Tottenham Court Rd, W.1, on 2 Dec. Long service awards will be presented by the president, Mr H. Butterworth.

Orders have been placed with Hoover for 30 washing machines, 80 steam-or-dry irons, 6 polishers and scrubbers and 8 cleaners, for use at the Olympic Village at Heidelberg, Melbourne, in 1956.

An order worth over £250,000 has been obtained by the British Thomson-Houston Co. from the N.C.B. for two automatically controlled, tower mounted, electrically driven 4-rope friction winders for Brodsworth Colliery in Yorkshire. The colliery is being reconstructed.

Annual meeting of the Instn. of Works Managers will take place at the Waldorf Hotel, London, on 18 Nov. at 7 p.m.

Birmingham Electric Club's 12th annual Children's Party has been arranged for 7 Jan. at the Grand Hotel.

Switch Plate Units

IN the advertisement for Nettle Accessories Ltd's new flush switch plate units on page 83 of our 3 Nov. issue, the description of the unit ref. ZC2110 should have read 1 gang 1 way and not 1 gang 2 way.

Skagerrak Cable

BRITAIN'S newest cableship, *Ocean Layer*, owned by Submarine Cables Ltd., sailed from Telcon Works, Greenwich, last week on her maiden voyage to the Skagerrak to lay a telephone cable between Denmark and Norway. The new cable, made at Greenwich, will provide the Danish and Norwegian Post and Telegraph Administrations with 60 simultaneous two-way telephone circuits over a distance of about 70 nautical miles. Given favourable weather conditions, the actual laying operations will take three days.

F.

QUESTIONS IN PARLIAMENT

Nuclear Power Station Sites

Extent of progress on the £300m programme of nuclear power development, especially as regards sites was the subject of questions by Mr H. Hynd and Mr H. Hughes last week. So far, replied Mr L. W. Joynson-Hicks, progress had been mainly in station design work and the search for sites. The C.E.A. had selected two, and four more were under urgent consideration. They were also pressing on with their search for others.

Glamorgan Power Station

THE C.E.A.'s application for permission to build a power station at The Leys, Glamorgan, has been granted. Mr L. W. Joynson-Hicks gave this information in a written answer, adding that the decision followed a public enquiry and consideration of all representations.

Herbert Report

REPORT of the Herbert Committee on the organisation of the electricity supply industry was expected before the end of the year, Mr L. W. Joynson-Hicks informed Mr A. Palmer last week.

Nuclear Generation

THE Minister of Works (as representing the Lord President of the Council) was asked last week to comment on the price of plutonium in connection with the Government's nuclear energy plan. He referred his questioner to the paper read by Mr Jukes at Geneva and stated that the price of this element is unlikely to fall below several thousands of pounds per kilogram in the next 20 or 25 years. This refuted an allegation that the nuclear-energy-based electricity plan would be uneconomic. In a later answer, he emphasised that the Atomic Energy Authority is not responsible for the development of nuclear energy for civil purposes beyond the stage of design and trial of new equipment.

Geneva Conference Report

FORTY-ONE sets and 80 individual volumes of the proceedings of the Geneva Conference on the Peaceful Uses of Atomic Energy had been ordered from H.M. Stationery Office at the special pre-publication price of £39, Mr R. A. Butler stated. The report would be widely publicised before publication on 1 Jan. He added that the U.N. did not propose to publish a short summary.

Reduction of Expenditure

THE contribution of the Scottish Boards towards economy in inessential expenditure and reduction in capital investment programmes was asked for in a series of questions put by Mr G. Nabarro. Mr Henderson Stewart said the matter was still under discussion and in spite of persistent questioning, declined to say when he would be in a position to make a statement. Mr Nabarro then asked for the same Board's economies in promotional advertising compared with the £500,000 p.a. reduction by the gas and electricity boards south of the Border. Mr Stewart said the decrease in advertising expenditure (by the Scottish Boards) in the current financial year would be by about 33⅓%. This did not satisfy Mr Nabarro who pointed out there was no alternative supply of electricity in the Highlands, and asked why a State Monopoly found it necessary to spend consumers' money on promotional advertising. There was no reply.

Railway Modernisation

THE Minister of Transport assured Mr H. Hynd that work was proceeding on the programme of railway modernisation and re-equipment according to the two-yearly forecast issued by the Transport Commission on 5 May. He added that the Commission hoped to make another forecast at the beginning of next year.

Export Trade

IN the Ballot for Notices of Motions, Sir C. Taylor indicated that he would call attention to the need to increase our export trade, and move a resolution, on 18 Nov.

Transatlantic Cable

AFTER giving the progress to date of the cable ship *Monarch's* work in laying the transatlantic telephone cable, Dr C. Hill gave an outline of future plans. (The ship's work during the summer has already been noted in these pages). He said the ship would lay a two-way cable between Newfoundland and Nova Scotia early next summer, followed by the second one-way cable between Scotland and Newfoundland. The object was to have the whole system ready for service towards the end of 1956. Dr Hill added a word of praise and thanks for the achievements of all concerned on both sides of the Atlantic.

Clean Air

FEATURE of the debate last week on the Government's Clean Air Bill was that members on both sides of the House were all agreed on the objects of the Bill, if not on the methods of achieving them. The debate was opened by Mr W. F. Deedes, who outlined the Bill's four main aims. The first, he said, was to prohibit the emission of dark smoke from chimneys, railway engines and vessels. Given sound equipment and careful operation, bituminous coal could nearly always be burned in industrial furnaces without producing more than a light haze of smoke. In the second place, the Bill was designed to ensure that industrial furnaces installed in the future could be operated, as far as practicable, without emitting smoke.

The third main objective, continued Mr Deedes, consisted of provisions for reducing emissions of grit and dust. It was made obligatory to use such means as were practicable to minimise the emission of grit and dust from all furnaces, new or existing. The prevention of domestic smoke would be a major operation involving radical changes in fuel use, large-scale alterations of appliances and a great degree of public willingness. It was proposed to implement this by the gradual extension of smoke control areas.

Referring to sulphur as one of the most harmful forms of pollution, Mr Deedes said the problem of prevention was intractable and could not be cured in the present stage of technical knowledge by legislation. The Government had accepted the Beaver Committee's recommendation that the most efficient practicable method of removing sulphur should be used in new power stations in or near populated areas, and research was being pressed forward.

A Clean Air Council is to be established but will not be a statutory body. It is proposed that all provisions relating to industrial smoke, grit and dust should come into operation early in 1958. The smoke control area provision will not wait until then.

Automation

A SUGGESTION by Mr F. Beswick that an inquiry should be instituted in this country on similar lines to the U.S. Congressional Committee studying the effects of automation on industry and labour, was rejected by Mr H. A. Watkinson. He said D.S.I.R. were studying the technical problems. On the question of the general attitude of employers and trade unions it seemed that the matter was solving itself quite satisfactorily through normal procedure, and sufficient inquiry was being made.

Tummel Valley

DETAILS of the N. of Scotland Hydro-Electric Board's Constructional Scheme No. 31, the Tummel Valley (Additions Project) were given by Mr Henderson Stewart. He said the scheme provided for 3,900 kW of new plant and will enable 8,000 kW of existing plant, at present idle, to be used. Estimated cost of the 11,900 kW was £113 per kW. Estimated cost per unit of the 32·7m units to be produced was 0·53d., which was less than the cost of producing electricity by any other means and about one-third of the cost of generating from oil in the N. of Scotland.

Advanced Science Teaching

ABOUT 1,000 new laboratories had been built or started for maintained grammar and technical schools since 1945, stated Sir D. Eccles last week. Mr B. Longden had asked what improvements were envisaged for advanced science teaching in schools. Sir David said if any of the projects could not be carried out for under £10,000, he was ready to consider them on their merits. He also drew attention to last week's announcement that

industry had established a Trust to give grants at independent and direct-grant grammar schools.

Pollution of Thames

THE Water Pollution Research Laboratory were still working on their final report concerning the causes of pollution of the River Thames, Mr Duncan Sandys stated in a written answer.

Atoms for Peace Digest

PUBLICATION of a fortnightly "Atoms for Peace Digest" similar to that now issued by the U.S. Information Services was suggested by Mr W. Hamilton. The Minister of Works said the Atomic Energy Authority were considering how best they could provide information. An announcement would be made in due course, he added.

Hire Purchase Statistics

STATISTICAL assessment of how much effect the July credit restrictions had on hire purchase was not possible because no satisfactory figures of H.P. business were yet available, the President of the Board of Trade told Mr J. Grimond.

Export Credits Insurance

IN the year ending 31 Mar. last, premiums earned under the Credits Insurance Scheme amounted to £2,895,576, claims paid totalled £4,625,853, and recoveries on claims paid in previous years totalled £5,355,361, Mr P. Thorneycroft stated. He had been asked by Mr H. Spence the total amount of premiums paid to the Export Credits Guarantee Scheme, and the total claims paid by E.C.G.S. for the latest convenient 12-monthly period.

Monopolies' Copper Report

THE attention of trade bodies concerned had been drawn to the Monopolies Commission's Report on Semi-Manufacturers of Copper and Copper-Based Alloys, and their observations on its conclusions and recommendations had been invited, Mr Peter Thorneycroft stated last week.

Sayings OF THE WEEK

"We are living in a metal civilisation, and although polymers, plastics and bonded materials may partly take their place, the increasing demands for metals will continue." . . . SIR HAROLD HARTLEY, at the British Institute of Management conference.

"I must emphasise again that without an adequate home market we cannot export effectively or competitively." . . . MR LESLIE GAMAGE, speaking at Liverpool.

"I look forward to the day when an internal combustion engine will not be allowed in the centre of London." . . . MR R. BELL, M.P., in the debate on the Clean Air Bill.

ELECTRIC SUPPLY NEWS

Argyll

The island of Luing, off the Argyll coast, was last week connected to the system of the North of Scotland Hydro-Electric Board. Power is taken from the Board's network on the mainland by an overhead line across the Cuan Sound. About 20 households were connected and a further 30 are shortly to be supplied.

Colchester

The question of overhead lines and television aerials was discussed at last week's meeting of the Colchester Town Council. The Highways Committee had recommended that, in connection with an application by the Eastern Electricity Board for permission to erect overhead lines in Gosbeck Rd, representations be made that cables should be placed underground in the interests of amenity and road safety. One member argued that o.h. lines were no more ugly than television aerials. An amendment that the o.h. lines be permitted was put forward, it being contended that with the introduction of other industries in what was a light industrial area, the cables would ultimately be relaid underground. The amendment was rejected, however, and the Highway Committee's recommendation agreed to.

Devon

The drogue cable of a target-towing aircraft fouled the transmission line of the South Western Electricity Board last week, cutting off supplies to a large section of North Devon. Power was restored to all areas within a few hours.

Isle of Man

The Bill to allow the Isle of Man Electricity Board to borrow the £63,000 which it has to pay the Douglas Corporation under an arbitration award, was piloted through the House of Keys a few days ago. During the discussion one member doubted the wisdom of passing the Bill, in view of the recommendation of a Commission that the undertakings of the Board and the Corporation should be brought under one authority, and it might be that the two parties would iron out their differences. He also asked if there had been any approach to pay the sum by instalments. It was then stated that the amount was payable immediately and the Corporation could enforce the award, to which another member added that the Board had already received a demand threatening legal proceedings if the money was not paid.

N. of Scotland

The North of Scotland Hydro-Electric Board hoped to have in operation before the end of the winter six more power stations with an aggregate capacity of 151 MW and an estimated output of 258m units annually, Mr W. R. Brown told members of the Scottish branch of the Institution of Municipal Engineers last week. Since the Board was formed just over 10 ten years ago capital expenditure up to the end of 1954 was £118,475,000, said Mr Brown, yet the overall cost of generation by water was 0·46d against the 0·6d cost for a modern coal-burning station using high-pressure steam plant. He calculated that 10% of the resources of water power had already been harnessed, and in the next 10 years the board would have under construction, being promoted, or under active survey, a further 20%.

Rotherham

Grit deposits from the local power station were again mentioned at last week's meeting of Rotherham Town Council. A recommendation to submit a petition from local residents and a letter from the local fire brigade to the Sheffield, Rotherham and District Smoke Abatement Committee for immediate action was approved.

S. of Scotland

The South of Scotland Electricity Board have approved a scheme to provide two new 1,000 kVA substations at Polwarth Grove and Mardale Crescent, Edinburgh, to reinforce the supply to the surrounding area. The scheme, which will cost approximately £18,000, will reduce the load on Bruntsfield and Merchiston Mews substations and improve the voltage regulation of the area. The Board have also approved a scheme for the reinforcement of supply to Annan. Two 5 MVA 33/11 kV transformers at Annan substation are to be replaced by two 10 MVA units at an estimated cost of £37,400. The two 5 MVA transformers will be available for use elsewhere on the Board's system.

LIGHTING SCHEME

Bicester. The U.D.C. has approved a lighting scheme for Sheep St, at an estimated cost of £3,000.

Berkhamsted. The Council is considering a scheme for improved lighting in High St.

Dewsbury. Ministerial approval has been received to the conversion of present lighting on main roads and bus routes to sodium lighting at a cost of £10,792.

Ealing. It is proposed to provide street lighting along the unlit section of Western Ave, from Ealing Rd to Islip Manor Rd, at a cost of £7,600.

Lowestoft. T.C. has been recommended to accept in principle a £150,000 scheme for improving street lighting.

Romford. The Council has approved a £29,598 scheme for improved lighting along Eastern Avenue between Gallows Corner and Whalebone Lane.

COMPANY ACTIVITIES

SOME members of Veritys are dissatisfied with the conduct of their company's affairs. They want to remove from the board the chairman and managing director. To do so they are convening an extraordinary general meeting. This development comes after a period of fluctuating share prices, which followed rumours of a possible amalgamation and then on the board's statement that a proposal had been turned down. Price of the 5s. Ordinary is now 10s. 6d. against a high for the year of 12s. 4½d. Certainly the company has not advanced since the war as most. But since the change in management which followed losses and passing of dividend in 1950 there has been a definite improvement each year with the dividend going up to 12½%. On the merger too, the present board seem to have acted reasonably. The other company concerned is in a different specialist field of manufacturing liquid containers, pressure vessels, etc., against Verity's business of marine electrical machinery, switchgear, etc. Unless it is because they hope to put more ginger into the board, there seems no adequate reason at the moment why the general body of shareholders should rush to support the requisitioners in their quest.

Trebled profits since 1947 are an achievement even in these inflationary days. Such has been the experience of J. and F. Stone Lighting and Radio, for whom record profits have become a habit. The expansion has been built in solid fashion. There was only one share bonus—of 50% in 1954. Retentions of earnings have risen from £8,389 in 1947 to £193,578 for the year to June last. H.P. sales play a big part, but recent restrictions may offset some of the benefits still to come from last year's record agreements.

One of the first of the electrical companies to watch its dividend P's and Q's is Crompton Parkinson. The total payment for the year of 16% is exactly equal to the former 20% which was paid before the 25% scrip issue, and the cash bonus also works out the same at the present 6 p.c. Nevertheless, group income is nearly £200,000 higher at £2,236,000 after payment of tax the net surplus is £908,000 against £764,000. Allowing for the new profits tax the earnings are about 31%. At 15s. 9d. the 5s. Ordinary units yield 5½%.—*From our City Correspondent.*

Falk, Stadelmann and Co. Ltd.

An increase in profit and in dividend for the year ended 31 Mar. last is reported by the directors. Consolidated profit for the period amounted to £629,077, compared with £493,224 a year ago, and the net profit after taxation, etc., is £209,012 (*£142,456*). A final dividend of 10% makes the total 17½%, against 15% last time. The improved results have been achieved by a considerable increase in turnover, despite lower margins of profit, in the face of severe competition, Mr H. Falk, the chairman, reports.

Year to 31 Mar.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1951	572,425	194,329	55	15	50/–	40/6
1952	662,419	183,708	50	15	41/3	34/3
1953	400,163	40,140	6	15	44/3	37/6
1954	550,839	136,466	33	15	49/–	36/6
1955	629,260	204,736	51	17½	50/7	43/9

Holophane Ltd.

An increase in the volume of business during the past year is reflected in the profit figures. Current assets at 30 June last totalled £472,680 (*£508,416*) of which balances at the bank and cash in hand accounts for £220,408 (*£37,061*). Current liabilities are listed at £95,272 (*£93,250*).

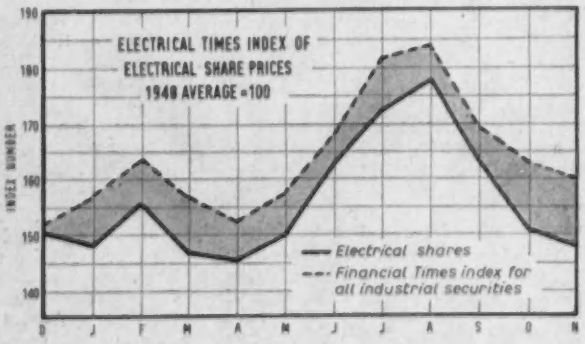
Year to 30 June	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1951	89,809	38,461	73	15*	10/6	7/6
1952	143,230	52,034	66	20	11/9	7/6
1953	126,193	46,915	57	20	13/9	11/1
1954	120,172	48,533	59	20	18/3	13/1
1955	132,204	61,343	71	30	19/10	15/7

*Plus 50% capital bonus.

Scottish Cables (South Africa) Ltd.

The volume of output during the year ended 30 June last was much greater than in the previous year, but the margin of profit was less, Mr William Fraser, the chairman, stated at the annual meeting last week. There was an improvement in the second half of the year, particularly concerning incoming orders, and the company has made a good start for the current year.

The fall in share prices may well have been arrested judging by the indices at the end of October. Activities last month showed a decline of only 3·0, the "Financial Times" index for all industrial shares differing by 2·9 to 160·3 and the "Electrical Times" index for all electrical shares falling from 151·6 to 148·2



J. and F. Stone Lighting and Radio

The past year's trading was affected considerably by changes in hire-purchase requirements, following the initial avalanche of such orders for radio and TV sets and domestic appliances. The result is shown in the full accounts. The volume of money invested in h.p. agreements at 30 June last was £1,404,000, compared with £308,000 a year earlier. This also means that there has been built up for future collection a substantial volume of income. Mr D. G. Nairn, the chairman, also reports that the prospects for the current year are encouraging.

Year to 30 June	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1951	515,054	170,420	75	40	18/10	14/–
1952	570,233	168,996	75	40	16/10	11/6
1953	761,900	183,014	82	50	28/9	14/4
1954	895,261	252,582	76	50*	38/3	18/4
1955	980,850	366,078	106	50	41/4	26/–

*Plus 50% capital bonus.

Sun Electrical Co. Ltd.

After charging increased taxation, the profit for the year ended 30 Apr. last is £43,616, compared with £24,392 a year ago. A final dividend of 15% makes the total distribution 20% (*15%*).

Tube Investments Ltd.

The group trading profit of the subsidiary companies for the year to 31 July last is £10,800,864, against £7,685,666 for the previous period, according to the preliminary statement. After all charges, including taxation, the net profit figures are £4,428,523 and £2,687,484, respectively. The final dividend is 12½%, making a total of 22½% for the year.

Veritys Ltd.

It is now revealed that the firm involved in an offer for the shares, earlier reported, is Rye-Arc, of London, who are ship repairers and general engineers. Following the issue of the circular by the board of Veritys Ltd., to which we referred last week, the requisitionists have stated that they believe the management of the company would be able to give considerable service to the business of Veritys. A substantial number of the shares held by the requisitionists have been held for several years, they add.

Dividends Declared

Atlas Electric and General Trust. Interim 3% (*nil*).

Broadcasting Relay Service. Interim 5% tax free.

Brush Group. Interim 3% (*same*) but on larger capital.

W. Canning and Co. Interim 5% (*same*).

J. Stone and Co. (Holdings). Interim 4% (*same*).

G. and J. Weir. Interim 7½% (*same*).

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

11 Nov.—Aberdeen. Installation in police stations at Lhanbryde and Hopeman.—See 3 Nov. issue.

11 Nov.—Abingdon T.C. Sodium lanterns, auxiliary gear, concrete columns, etc., for Group A lighting along trunk road A.34.—See 20 Oct. issue.

11 Nov.—Malden and Coombe T.C. Sodium lanterns on concrete columns for Group A lighting in Church Rd.—See 20 Oct. issue.

11 Nov.—Co. Meath. Installation at Dunslaughlin school.—See 27 Oct. issue.

12 Nov.—Port Talbot T.C. Class A steel columns, fluorescent and sodium discharge lamps, etc., along A.48.—See 27 Oct. issue.

14 Nov.—Bentley-with-Arksey U.D.C. Installation at 26 houses at Scawthorpe.—See 27 Oct. issue.

14 Nov.—Bournemouth T.C. Street lighting units, with columns, H.P.M.V. enclosed type lamps.—See 3 Nov. issue.

14 Nov.—Chadderton U.D.C. Street lighting lanterns of sodium, mercury, and tungsten types with control gear, etc.—See 27 Oct. issue.

14 Nov.—Lichfield T.C. Steel columns, sodium and fluorescent lanterns, for Group A lighting along A.38.—Advertised in 27 Oct. issue.

14 Nov.—N. Ireland. Installation in 160 dwellings at Holywood; 33 at Keady; 20 at Victoria Bridge; and 4 at Strabane.—See 3 Nov. issue.

15 Nov.—Lancashire. Electrical installation at Kearsley Prestolee county school. Apply by above date to County Architect, P.O. Box 26, County Hall, Preston, quoting ref.: A/MG.

15 Nov.—Launceston R.D.C. Supply and installation of electrically driven submersible pump at Tregadillett. Engineer and Surveyor, 20 Western Rd.

15 Nov.—Southampton T.C. Installation at Thornhill junior and infants' school.—Advertised in 27 Oct. issue.

16 Nov.—Edinburgh. Electrical maintenance work at five hospitals.—See 27 Oct. issue.

17 Nov.—Sunderland T.C. Installation in shops and flats on Hylton Castle estate.—See 3 Nov. issue.

18 Nov.—Blackpool. Pumping plant at Goosnargh, for Whitechapel water supply.—See 27 Oct. issue.

18 Nov.—Castleford T.C. Supply only of fluorescent lamps and fittings for lighting covered market. Engineer and Surveyor, Town Hall.

19 Nov.—Arnold (Notts) U.D.C. Supply and delivery only of concrete street lighting columns and fittings on Oxclose estate. Surveyor, Arnot Hill Hse.

19 Nov.—Connah's Quay U.D.C. Group B concrete columns and sodium lamps, etc.—Advertised in 3 Nov. issue.

19 Nov.—Co. Galway. Pumping and filtration plant at Oughterard.—See 29 Sept. issue.

19 Nov.—N. Ireland. Electrical equipment for Mid-Ulster Hospital Committee.—See 3 Nov. issue.

19 Nov.—Winchester T.C. Electrical installation in 18 dwellings in Airlie Rd. A. P. Gainsford, architect, 29 The Square.

21 Nov.—Barnes T.C. Supply and installation of about 120 140 W sodium lanterns, lamps, etc., with 70 concrete and 15 steel columns for Group A lighting along two miles of main road. W. R. Shepherd, Engineer and Surveyor, Municipal Offices, Sheen Lane, S.W.14.

21 Nov.—Cheadle and Gatley U.D.C. Group B concrete columns and brackets.—See 3 Nov. issue.

21 Nov.—Middlesex. Cables for power supply, with lighting and plug circuits at Mogden purification works.—Advertised in 20 Oct. issue.

21 Nov.—Co. Offaly. Installation at district hospital and clinic at Birr.—See 3 Nov. issue.

21 Nov.—Peterborough T.C. Lighting and power installations in 42 houses in Tennyson and Wilberforce Rds. Apply by above date to L. H. Robjohn, Engineer and Surveyor, Town Hall. Deposit £2. 2s.—Advertised in this issue.

21 Nov.—Taunton T.C. Supply of electrical goods during 1956. Town Clerk, Municipal Buildings.

21 Nov.—West Riding. Rewiring part of Selby School of Art and Technical Inst. Apply by 14 Nov. to County Architect, Bishopgate, Westfield Rd, Wakefield.

21 Nov.—West Riding. Installation at Castleford grammar school. Apply by 14 Nov.—Advertised in 3 Nov. issue.

23 Nov.—Ipswich T.C. Supply and erection of about 21 Group A steel columns with about 50 140 W sodium cut-off and non-cut-off top and side entry lanterns, lamps, etc., along trunk road A.12. Engineer and Surveyor, 19 Tower St. Deposit £1. 1s.

25 Nov.—Barnstaple T.C. Supply and erection of 40 street lighting units on West Sowden estate, 3 in Burlington Grove and 6 in Lower Raleigh Rd. Borough Surveyor, The Castle.

25 Nov.—Burton-on-Trent T.C. Installation of (*a*) 126 150 W tungsten units for Group B street lighting; (*b*) 109 sodium and 14 500 W tungsten units for Group A scheme; and (*c*) 123 3 x 80 W fluorescent units for Group A scheme. All on concrete columns. Borough Surveyor, Town Hall.—Advertised in this issue.

25 Nov.—Lowestoft T.C. Supply and erection of 198 Group A sodium lighting units along four miles of London to Gt Yarmouth trunk road A.12. Engineer and Surveyor, Town Hall. Deposit £2. 2s.

25 Nov.—Romford T.C. Supply of tower wagon and two 5 cwt vans. Town Clerk, Town Hall.—Advertised in this issue.

28 Nov.—Fifeshire. Group A lighting at Windygates.—See 13 Oct. issue.

28 Nov.—Heckmondwike U.D.C. Mercury vapour lighting units on concrete columns along trunk rd, A.62.—Advertised in 3 Nov. issue.

28 Nov.—Rawtenstall T.C. Concrete columns, sodium lighting units, etc., for Group A lighting along A.56.—See 3 Nov. issue.

28 Nov.—Reading T.C. Manufacture, erection, etc., of duplicate automatic electrically driven centrifugal booster pumps, electric motors and auxiliary plant, for Emmer Green station. Water Engineer and Manager, 16-20 The Forbury. Deposit £3. 3s.

28 Nov.—Rochdale T.C. Lighting and power installation at Castlemere school. Borough Surveyor, Town Hall.

29 Nov.—Roxburghshire. Installation in St. Boswells primary school.—See 3 Nov. issue.

29 Nov.—Wigan T.C. Electrical work in connection with housing schemes. Borough Engineer, Municipal Buildings, Hewlett St.

30 Nov.—Nottingham T.C. Supply of electric lamps and accessories for school in 12 months from 1 Apr. Director of Education, Exchange Buildings.

30 Nov.—Tottenham B.C. Lamps in year from 1 Apr., 1956.—See 27 Oct. issue.

1 Dec.—Belfast T.C. Workshop equipment at power station West.—Advertised in 3 Nov. issue.

1 Dec.—Cheshire. Approved lists of contractors are being compiled.—See 27 Oct. issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 107 queries answered this week

"Kingston" lamps, makers of? N.W.—Kingston Lamp Co., Ltd., 6/12 New Cleveland St, Hull.

Independent electric wringers, makers of? B.W.—Acme Wringers Ltd., David St, Glasgow, S.E.

"Bosch" high-speed motors, address for? F.W.H.—Bosch Ltd., 20 Carlisle Rd, Hendon, N.W.9.

"Rotaflex" shades, makers of? G.R.M.—Rotaflex (Gt. Britain) Ltd., 90 Regency St, S.W.1.

Spring-loaded cable drums, makers of? D.E.—Deco Eng. Co., Ltd., Deco Works, West Row, W.10; Power House Components Ltd., Wayne Hse, Regent St, Nottingham; Sturge and Co., Ltd., Sheepcote St, Birmingham; Metropolitan Tool and Products Ltd., 21 Victoria St, Nottingham.

"Magslip" remote indication equipment, makers of? E.M.P.—Muirhead and Co., Ltd., Beckenham, Kent.

"Skarsten" paint strippers, makers of? W.E.—Skarsten Mfg. Co., Ltd., 21 Hyde Way, Welwyn Garden City, Herts.

1 Dec.—Co. Down. Electrical installation at Saintfield intermediate school and meals kitchen. J. McCandless, consulting engineer, 6 Murray St, Belfast. Deposit £3. 3s.

2 Dec.—Mablethorpe and Sutton U.D.C. Electrically-operated submersible pumps with switchgear, etc., at Maltby pumping station.—See 27 Oct. issue.

3 Dec.—Honiton (Dev) T.C. Installation of street lighting along about 2,300 yd of trunk road A.30. Borough Surveyor, Municipal Offices, New St.

3 Dec.—Lincoln. Land drainage pumps and electric motors, etc., for Upper Witham Internal Drainage Board.—See 20 Oct. issue.

3 Dec.—Liverpool. Electrical services, including lighting, power, fire alarms, etc., at Hesketh Park Hydro, Southport, for Hospital Board. M. H. Cooke, Regional Engineer, 2 Union St. Deposit £2. 2s.

5 Dec.—Dublin. Electrical installation in dispensary in Grange Cross Rd, Ballyfermot. Varming and Mulcahy, consulting engineers, 70 Merrion Sq, Dublin. Deposit £10.

5 Dec.—Leeds T.C. Electrically-driven centrifugal pumps with motors and switchgear for Headingley filtration works pumping station.—See 6 Oct. issue.

12 Dec.—Easthampstead R.D.C. Group A and B street lighting units.—Advertised in 13 Oct. issue.

11 Jan.—Dublin T.C. Sewage pumps and electric motors and storm water pump and electric motor for Kilbarrack pumping station.—See 27 Oct. issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

23 Nov.—India. High tension switchgear required for Porbandar, Surendranagar, Gondal, Morvi, and Rajkot and pole mounted transformer substations. Chief Engineer, Madras Port Trust. B.o.T. (Ref.: ESB 22774/55).*

24 Nov.—South Africa. Supply of six 15 kVA 380/220 V, 3-phase, 4-wire, 50 c/s, self-regulating, direct coupled alternator-oil engine lighting sets complete, skid mounted and with switchboard. Union Tender and Supplies Board, P.O. Box 371, Pretoria. B.o.T. (Ref.: ESB 23958/55).*

25 Nov.—South Africa. Total of 6,736,400 ft of electrical signalling cable required by Stores Dept. of S. African Railways, Johannesburg. Tender No. C.5323. B.o.T. (Ref.: ESB 23305/55).*

26 Nov.—Kenya. Tenders invited for installation of mercury vapour street lighting in central shopping area of Eldoret. R. D. Williams, acting town clerk, Municipal Offices, P.O. Box 40, Eldoret. B.o.T. (Ref.: ESB 23735/55).*

29 Nov.—Egypt. Supply of 30 500 kVA, and 70 300 kVA, and 3-phase 10500/380/220 V transformers. Cairo Electricity and Gas Admin., 26 July St, Cairo. B.o.T. (Ref.: ESB 22797/55).*

29 Nov.—U.S.A. 115 kV and 230 kV electrical equipment for Dallas Dam power station, including lightning arresters, bus insulators, disconnect switches. Invite No. CIVENG-35-026-56-58. District Engineer, Corps of Engineers, U.S. Hanson's Electronics at 2 Hall St, and Army, 628 Pittock Block, Portland 5, Oregon. B.o.T. (Ref.: ESB 22250/55).*

30 Nov.—Greece. Supply of 36,000 metres rubber insulated cables N.S.H. for Defence Ministry. Tender 389.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 8 November

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	370	+2½	280
,, (3 months)	336	−1⅝	265
R.S.T. (Rhodesian Selection Trust) group price*	360	—	—
LEAD, refined pig, min. 99·97% purity (cash)	106½	−½	110½
,, (3 months)	106½	—	105½
TIN, refined, min. 99·75% purity (settlement)	770	−10	719½
,, (3 months)	752	−7	717½
ALUMINIUM, ingots 99·99·5%	171	—	150
ZINC, virgin, min. 98% purity (cash)	91½	+½	81½
,, (3 months)	90½	+½	81½
RUBBER No. 1, RSS. spot (per lb.)	32⅛d.	−2⅛d.	26⅛d.
,, c.i.f. basis, ports. Dec. (per lb.)	31⅛d.	−2⅛d.	24 3/16d.
ARMOURING :			
Galv. Steel Wire (0·104 in.)	56½	—	52½
Mild Steel Tape (0·04 in.)	43½	—	40½

(*Fixed price c.i.f. U.K., now subject to change at 24 hours' notice, to "consumers willing to instil a degree of stability into the resale price.")

State Procurement Service, Office No. 5, Ministry of Finance, 56 Panepistimiou St. B.o.T. (Ref.: ESB 23807/55).*

1 Dec.—India. Supply, etc., of turbines, generators, transformers and switchgear for Tungabhadra project No. 1. Documents from Director, Commerce and Industries Dept., Central Stores Purchase Section, Abid Rd, Hyderabad, at Rs 100 a set. Tender E/Hydro/10/55/257. B.o.T. (Ref.: ESB 23573/55).*

2 Dec.—South Africa. Supply of 200 e.h.t. outdoor fuse cut-outs for use with 11 kV 3-phase 50 c/s system. Contract E.2647. City of Durban Electricity Dept., West St. B.o.T. (Ref.: ESB 23510/55).*

5 Dec.—Rhodesia and Nyasaland. Supply, erection, etc., of 330 kV switchgear and associated switchgear at Kariba power station, and at five substations at Kitwe, Salisbury, Norton, Umniati and Bulawayo. Qualifications to Secretary, Federal Hydro-Electric Board, P.O. Box 630, Salisbury, with copy to consulting engineers, Merz and McLellan, Carliol Hse, Newcastle-on-Tyne.—Advertised in this issue.

7 Dec.—S. Rhodesia. Supply of 3-phase oil immersed air natural cooled, outdoor type 11000/400 V Delta/Star transformers with accessories: eighteen 30 kVA, thirty-six 50 kVA and twelve 100 kVA. Contract E197/1955. City Electrical Engineer, Bulawayo. B.o.T. (Ref.: ESB 22745/55).*

14 Dec.—New Zealand. Post and Telegraph Dept. invites tenders (P. and T. 157/328) for 30,500 ft of cable and conductors. Stores Div., Windsor Building, Willis St, Wellington. B.o.T. (Ref.: ESB 23411/55).*

15 Dec.—India. Supply of 132 kV and 66 kV transformers and a synchronising panel for Tadepalli and Renigunta substations. Specif. A.206, Superintending Engineer, 20 Rutland Gate, Nungambakkam, Madras 6. B.o.T. (Ref.: ESB 23276/55).*

16 Dec.—New Zealand. Tenders (S.17/55) invited by Auckland Electric Power Board, Queen St, Auckland, for supply of 650 street lighting fittings for 250 W mercury vapour lamps, and 100 for 400 W similar lamps. B.o.T. (Ref.: ESB 23399/55).*

17 Dec.—Tangier. Water and Electricity Board require electrical equipment and h.t. 5·5 kV feed. Board is at 89 Rue de Foucauld, 1ere etage Tangier. B.o.T. (Ref.: ESB 21606/55).*

Trade Notes

New Phone No. The telephone No. of the Lincoln branch sales office of British Insulated Callender's Cables Ltd. is now Lincoln 21351/2.

Flexible Hose. A new Anglo-American Company, Power Auxiliaries Ltd., has been formed for the production of "Plessiflex" seamless flexible metal hose. The new concern has been formed jointly by the Plessey Co., Ltd., and the D.K. Manufacturing Co. of Chicago.

New Factory. The Electrothermal Engineering Co., Ltd., has arranged with the L.C.C. for the lease of a site at Harold Hill, Essex, for a new factory.

Lamp Quota. The Government of Eire has fixed a quota of 100,000 on the number of electric filament lamps that can be imported into the country during the twelve months ending 30 Nov., 1956. Last year 2,962,165 filament lamps were imported (value £68,037), and for the first eight months of this year 1,539,165 lamps (value £88,454).

Contracts Placed

Birkenhead T.C. Lighting and power in Woodchurch secondary school for girls, £5,158, and same in Fender primary school, £1,281, F. Hancock (1939) Ltd.

Brentford and Chiswick T.C. Supply and erection of 225 street lighting units in four schemes, Revo Electric Co., Ltd., £14,857.

Brighton T.C. Floodlighting at Sports Arena, Philips Electrical Ltd., £9,000.

Carlisle T.C. Electrical installations in 214 houses, £5,414; and same in 22 bungalows and 16 flats, £879; both at Morton, Hartley Electromotives.

Hull T.C. Supply of various lead covered telephone cable, W. T. Glover and Co., Ltd., £10,895.

London. Electrical installation at Wenlake and Chadworth Buildings, Finsbury, Carr Bros and Carr (Wandsworth) Ltd., £7,405.

Minehead U.D.C. Supply and erection of 40 steel columns with fluorescent lanterns, etc., along trunk road A39, General Electric Co., £3,946.

Norfolk T.C. Electrical installation in Methwold secondary modern school, Eastern Electricity Board, £5,638.

Wandsworth B.C. Supply of 881 concrete columns for street lighting. Concrete Utilities Ltd.

BUSINESS PROSPECTS

Airdrie T.C. Plans approved for 280 houses in Dunrobin Rd.

Alloa. Dean of Guild Court has approved plans for an R.C. church in Mar St, South, estimated to cost £45,000.

Barnsley T.C. 1956-57 building programme now includes second instalment of extensions at Mining and Technical College (£170,000); an instalment of new secondary technical school (£106,822); and erection of junior school (£42,000).

Barnstaple. Factory and offices to be built in Braunton Rd for Hobart Manufacturing Co., Ltd., Lion Works.

Bath. Architect for factory proposed by Horstmann Ltd. is E. F. Tew, 7 Northumberland Buildings.

Belfast. Tenders may soon be invited for site works for hospital for children and women at Dundonald. Architect is F. Gibberd, 8 Percy St, London, W.1. Cost of complete scheme will be about £2m.

Blackpool. Exhibition hall at Stanley Park being planned by Textile Recorder Exhibitions Ltd., of Manchester. Estimated cost £200,000.

Breconshire. Plans by Sir Percy Thomas, 10 Cathedral Rd, Cardiff, for erection of new council chambers, approved. Estimated cost £86,000.

Burnley T.C. Adaptations to Town Hall basement to be carried out in two stages, the first to begin in 1956-57. Estimated cost £30,000.

Camberwell. Approval given to erection of 6-storey block of 30 maisonnettes, four terraces of 21 cottages, a block of 12 flats, and terrace of six dwellings for old people, near Rye Hill estate. Estimated cost £194,400.

Cambridge T.C. It is proposed to erect ultra-modern type secondary grammar school in Queen Edith's Way, at estimated cost of £170,000.

Cardiff T.C. Erection of 73 dwellings at Llanrumney. City Surveyor, City Hall.

Carlisle. Office block on Harraby industrial estate proposed by Automatic Coal Cleaning Co., Ltd. Plans by G. W. Danson, 54 Lowther St.

Cheltenham. V.P. Sheet Metal Ltd. planning new factory in Windsor St.

Chesterfield. New factory at Hackenthorpe to be built by British Furtex Ltd., Burgess Rd, Sheffield. Cost is estimated at £100,000.

Croydon. Architects for Oliver Typewriter Manufacturing Co. Ltd.'s new factory are E. Bates and W. G. Sinning, 89 Chancery Lane, W.C.2.

Devon. Approval given to erection of primary school at Woodford, Plympton, (£62,195); a county secondary school at Ivybridge (£159,217); and extensions to Tavistock grammar school (£176,420).

East Sussex. Among schools included in 1956-57 programme are £170,000 Hove mixed county secondary; first instalment of £116,000 Newhaven county secondary; and £225,000 Imber Horne county secondary.

Edinburgh. Approval given to erection of two 10-storey blocks of flats (120 dwellings) in Perry Rd Drive.

Enfield. It is proposed to erect junior mixed and infants' school at Manor Farm at estimated cost of £53,745.

Fife. Plans approved for extension and modernisation of Viewforth junior secondary school, and Moss-side secondary school, Cowdenbeath. Resp. estimated costs are £131,882 and £108,165.

Glasgow. Factory and offices in Pinkston Rd proposed by Twisteel Reinforcement Ltd., 43 Upper Grosvenor St, W.1.

Guildford. Plans being considered for development of 3 shopping sites and erection of 30 old peoples' bungalows in Aldershot Rd.

Hawick T.C. Dean of Guild Court has approved erection of 56 houses at Burnhead.

Holborn B.C. Plans being considered for erection of two 11-storey blocks of flats at first stage of Ormond Close site.

Ilford T.C. Recommendation submitted to have plans and detailed estimate prepared for erection of public baths at Barkingside. Cost estimated at £430,000.

Ipswich. Owen Cooper Theatres Ltd. are to rebuild Central Cinema in Princes St. Architect is L. C. Norton, 4 St. George St, Hanover Sq, London, W.1.

Jarrow. Site being sought by Charles Leeming and Co. (Great Britain) Ltd., 18 York Bldgs, London, W.C.2, for erection of new chemical works.

King's Lynn. Eagle Hotel in Norfolk St to be rebuilt for Coombe Reid and Co., Ltd. H. Marsh, 14 King St, is architect.

Lindsey. Construction of instalment of secondary modern school at Gainsborough. Myles-White, Vallance and Westwick, Paradise Hse, Paradise St, Sheffield.

Liverpool T.C. Construction of 41 dwellings in Croxteth Rd, 13 at Garston, and 5 in Princess St. Also various extensions at Speke Millwood county primary, Heath Rd secondary modern, Kingsthorne Rd county primary, and Morrison secondary modern schools. City Architect, Blackburn Chambers, Dale St, Kingsway.

Liverpool. Hospital Board's new outpatients' and casualty dept. at Chester Royal Infirmary, included in 1956-57 programme, will cost about £150,000.

London. Carpenters' Company planning reconstruction of Carpenters' Hall at 1 Throgmorton Ave, E.C.2. Estimated cost is £300,000. Architects are Whinney, Son and Austin Hall, 37 Norfolk St, W.C.2.

Mexborough U.D.C. Erection of 58 houses on Highwoods estate. Architect and Surveyor, Council Offices, Adwick Rd.

Northants. New county primary school to be built at Kettering; and infant welfare clinic and occupation centre at Dogsthorpe.

Nottingham. Site on corner of Plumtree St and Hollow Stone secured by F. M. Goodlud and Co., Ltd., 21 St Mary's Gate, for new factory.

Peterhead. Factory costing £357,100 to be built in Station Rd, for Cleveland Twist Drill Co. of America.

Rotherham. Congregational church to be built in Wickersley Rd. Estimated cost is £45,000.

Salop. School programme for 1956-57 includes instalments of Bridgnorth girls' modern (£108,800); Ketley / Hadley modern (£134,000); Wem secondary modern (£106,100).

Wiltshire. Included in 1956-57 school building programme are £142,824 Chippenham county secondary, and £110,710 Warminster county secondary.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Alcon. 741,429 and 741,432. Class 9. Electric switches for use in controlling the action of valves in pipe line systems. Alexander Controls Ltd., 141 Wood End Lane, Erdington, Birmingham 24.

Chemidus. 742,810. Class 9. Electrical apparatus, etc. Chemidus Plastics Ltd., 89 Upper Thames St, E.C.4.

Fenman. 738,609. Class 9. Radio, radar, television, telegraphic apparatus, etc. Pye Ltd., Radio Works, St. Andrews Rd, Cambridge.

Kolsterphone. B742,332. Class 9. Radio and telephone apparatus, etc. Kolster-Brandes Ltd., Crav Works, Sidcup, Kent.

Reactaline. 742,868. Class 9. Instruments and apparatus, etc. Ether Ltd., Tyburn Rd, Erdington, Birmingham 24.

Gazette Announcements

COMPANIES ACTS

Ace Electronics Ltd. First and final dividend to preferential creditors to be distributed. Claims to W. L. Norman of B. Davis and Co., 59 Sloane St, S.W.1, or A. W. Hunter of Latham and Co., Walter Hse, 418-22 Strand, W.C.2, by 28 Nov.

Dalmere Electronics Ltd. Meetings of members and creditors will take place at offices of Joseph W. Shepherd and Co., 78 King St, Manchester, on 30 Nov. at 11.45 a.m. and 12 noon resp., to receive liquidator's report.

Corona Lampworks (Southern) Ltd. Petition for winding-up presented on 2 Nov. and directed to be heard at Royal Courts of Justice, Strand, on 21 Nov. Interested persons should contact W. T. Jones, 18 John St, Holborn, W.C.2, by 19 Nov.

United Metal Electrodes and Welding Equipment Ltd. Resolution for voluntary winding-up passed at meeting on 2 Nov. K. M. Parry of 14 Leadenhall St, E.C.3, was appointed liquidator, and creditors are asked to send particulars to him by 31 Dec.

BANKRUPTCY ACTS

Public Examinations

Hastings. William O. Curry, electrical contractor, trading at 1 Tynevale Terr, Lemington-on-Tyne, Northumberland. Public exam. will be at Town Hall, Hastings, on 13 Dec. at 2 p.m. First meeting was on Tuesday (8 Nov.).

London. W. Zack, electrical contractor, of 111 Lordship Rd, Stoke Newington, N.16. Public exam. at Bankruptcy Buildings, Carey St, W.C.2, on 29 Nov. at 11 a.m. First meeting took place yesterday (9 Nov.).

Release of Trustee

Sheffield. Albert C. Payne, electrical contractor, of 40 Springfield Rd, Wickersley, Rotherham. Trustee was J. B. G. Gibbs, Official Receiver, 55 Queen St, Sheffield.

Receiving Order

Worcester. F. Simons, electrical contractor of 15 The Council Hse, Winchcombe Rd, Sedgeberrow, Evesham. Date of receiving order, 1 Nov.

Appointment of Trustee

Southend. Edward Newland, electrical contractor of 130 Grove Rd, Chadwell Heath, Romford. Trustee is D. A. Jacobs, C.A., 18 Bentinck St, W.1.

First Meeting

Southend. G. E. Stenhens, electrical contractor of 142-44 Old High St, Grays. First meeting will be at 58-61 York Ter, Regent's Park, N.W.1, on 17 Nov. at 11 a.m., and public examination at County Hall, Alexandra Rd, Southend, on 20 Dec. at 11 a.m.

MEETINGS TO NOTE

THURSDAY, 10 NOV.

I.E.E. (London). "Germanium and Silicon Power Rectifiers." T. H. Kinman, G. A. Carrick, R. G. Hibberd and A. J. Blundell. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (Swansea). "Design, Performance and Application of Miniature Circuit-Breakers." H. W. Wolff and T. G. F. Atherton. Elect. Showrooms, The Kingsway, 6 p.m.

I.E.S. (Birmingham). Ladies' night at Botanical Gardens Ballroom, Westbourne Rd, Edgbaston.

BRITISH INSTN. OF RADIO ENGRS. (Scottish). "Applicants of Electronics to Marine Echo-Sounding." F. Baillie, 39 Elmbank Cresc., Glasgow, 7 p.m.

INCORP. PLANT ENGRS. (Glasgow). "Modern Textile-drying Methods." K. S. Laurie. Building Centre, 425 Sauchiehall St, 7 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (Liverpool). "Embedded Panel Warming." F. Maguire. College of Buildings, Clarence St, 6.30 p.m.

I.E.E. (Bristol Students). "Vacation Training in Canada." H. M. Jenkins. Elect. Hse, Colston Ave, Bristol, 7 p.m.

FRIDAY, 11 NOV.

I.E.E. (N. Midland Utilisation). "Timing the Operation of Control Systems Associated with Rotating Equipment," C. Cuthbert and D. A. Picken; "Dynamic Braking of Induction Motors." D. Harrison. Elect. Offices, 1 Whitehall Rd, Leeds, 6.30 p.m.

I.E.E. (S.E. Scotland). "Outline of Developments in Electric Power Stations." C. W. Marshall. North British Station Hotel, Edinburgh, 6.30 p.m.

I.E.E. (Swansea). Annual dinner and dance at Osborne Hotel, Langland Bay, 7 p.m.

E.P.E.A. (S. Meter Engrs.). "Relays for Network Protectors." W. Salter. Caxton Hall, Westminster, 6.30 p.m.

ELECTRICAL INDUSTRIES BALL in aid of E.I.B.A. at Grosvenor Hse, Park Lane, London.

A.S.E.E. (N.E. London). Annual dinner at Angel Hotel, Ilford.

A.S.E.E. (W. England). "Back Pressure Steam Turbines." D. N. de Mattos. Grand Hotel, Bristol, 7.30 p.m.

A.S.E.E. (Stoke and Crewe). Films: "Steel and Atomic Energy." Royal Hotel, Crewe, 8 p.m.

BIRMINGHAM ELECTRIC CLUB. "Germanium Power Rectifier." G. A. Carrick. Grand Hotel, 6.15 p.m.

MONDAY, 14 NOV.

I.E.E. (London). Discussion on "Is Engineer Broad Enough in his Outlook?" P. Dunsheath. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (E. Anglia). "Automatic Circuit Reclosers." G. F. Peirson, A. H. Pollard and N. Care. Crown and Anchor Hotel, Ipswich, 6.30 p.m.

I.E.E. (Mersey and N. Wales). Annual dinner at Grosvenor Hotel, Chester, 7 p.m.

I.E.E. (S. Midland Supply and Utilisation). "Proving Performance of Circuit-Breakers, especially those of Large Breaking Capacity." J. Christie, H. Leyburn and J. F. Bird; "New Testing Station for High-Power Circuit-Breakers," J. Christie, H. Leyburn and R. W. Fenn. Imperial Hotel, Birmingham, 6 p.m.

I.E.E. (Western). "Electrification of Manchester-Sheffield-Wath Lines of B.R." J. A. Broughall and K. J. Cook. Elect. Hse, Colston Ave, Bristol, 6 p.m.

I.E.E. (N. Eastern). "Transatlantic Telephone Cable." M. J. Kelly, Sir Gordon Radley, G. W. Gilman and R. J. Halsey. Neville Hall, Newcastle, 6.15 p.m.

I.E.S. (Sheffield). "Interior Decoration and Lighting." J. Wilson. The University Western Bank, 6.30 p.m.

LEICESTER ELECT. SOC. Meeting at Elect. Offices, Charles St, 7 p.m.

INCORP. PLANT ENGRS. (Dundee). Discussion on "Fire Prevention." N. Hastie. Mathers Hotel, 7.30 p.m.

A.S.E.E. (Central London). "Electric Floor and Wall Warming." At 7 Victoria St, S.W.1, 6.15 p.m.

A.S.E.E. (N.W. London). "High Frequency Induction Heating." Century Hotel, Forty Ave, Wembley Park, 8.15 p.m.

TUESDAY, 15 NOV.

I.E.E. (London Measurement and Radio). "Electrolytic-Tank Equipment for Determination of Electron Trajectories; Potential and Gradient"; "Method of Tracing Electron Trajectories in Crossed Electric and Magnetic Fields." D. L. Hollway. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (London Students). "Introduction to the Transistor." A. V. Bryant, R.E.M.E. Training Centre, Arborfield, 7 p.m.

I.E.E. (N.W. Utilisation). "Timing the Operation of Control Systems Associated with Rotating Equipment." C. Cuthbert and D. A. Picken: "Dynamic Braking of Induction Motors." D. Harrison. Engrs. Club, Albert Sq, Manchester, 6.15 p.m.

I.E.E. (N. Staffs). "Maintenance Principles for Automatic Telephone Exchange Plant." R. W. Palmer. Duncon Hall, Stone, 7 p.m.

I.E.S. (Glos and Cheltenham). "Prescribing for Seeing." M. L. Berson. 47 Promenade, Cheltenham, 6.30 p.m.

I.E.E. (Scottish). Dinner dance at Grosvenor Restaurant, Gordon St, Glasgow, 6 p.m.

INSTN. OF MECHANICAL ENGRS. "Development of Mechanical Draught Water-cooling Tower." L. Gilling Smith and G. J. Williamson. Instn. of Civil Engrs., Great George St, S.W.1, 5.30 p.m.

A.S.E.E. (London). "Fault Protection in Large Distribution Networks." J. E. Fitzpatrick. Magnet Hse, Kingsway, W.C.2, 6.30 p.m.

A.S.E.E. (Portsmouth). "Consumer Relationship." W. B. Butler. Air Balloon, 598 Commercial Rd, Mile End, 7.30 p.m.

WEDNESDAY, 16 NOV.

I.E.E. (London Supply). Discussion on "Thermal Rating of Transformers." R. A. Grierson. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (E. Anglia). Annual dinner dance at Dorothy Restaurant, Sydney St, Cambridge, 7 p.m.

I.E.E. (Sheffield). "New Lamps, New Uses and New Lighting Techniques." R. V. Mills. Grand Hotel, 6.30 p.m.

I.E.E. (Southern). "Electrical Energy from the Wind." E. W. Golding. S.E. Elect. Board Offices, Hove, 6.30 p.m.

I.E.S. (Leeds). "Modelling with Light and Colour." J. W. Howell. Church Hse, North Parade, Bradford, 7 p.m.

I.E.S. (N. Lancs). "Shop Window Lighting." R. L. C. Tate. Elect. Offices, 19 Friargate, Preston, 7.15 p.m.

I.E.S. (Tees-side). "Contemporary Lighting." K. S. Morris. Cleveland Inst., Middlesbrough, 6.30 p.m.

INCORP. PLANT ENGRS. (Kent). "Refrigeration and Its Application." R. F. Brown. Bull Hotel, Rochester, 7 p.m.

A.S.E.E. (Nottingham). American industrial film evening. Elect. Offices, Smithy Row, 7.30 p.m.

A.S.E.E. (Preston). "Shop and Window Lighting." R. L. C. Tate. 19 Friargate, 7.15 p.m. (Check I.E.S.).

THURSDAY, 17 NOV.

I.E.E. (London Utilisation). "Timing the Operation of Control Systems Associated with Rotating Equipment." C. Cuthbert and D. A. Picken: "Dynamic Braking of Induction Motors." D. Harrison. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (Irish). "Tools of Management." E. R. Cox. Physical Lab., Trinity College, Dublin, 6 p.m.

I.E.S. (Manchester). "Shop Window Lighting." R. L. C. Tate. Elect. Offices, Town Hall Extension, 6 p.m.

CHELMSFORD ENGRNG. SOC. "The Toronto Subway." G. J. Corson. Crompton's Hall, 7.30 p.m.

A.S.E.E. (Kent). Film show at Royal Star Hotel, Maidstone, 8 p.m.

A.S.E.E. (Southampton). Technical films at Polygon Hotel, 8 p.m.

FRIDAY, 18 NOV.

I.E.E. (N. Midland). Annual dinner at Queen's Hotel, Leeds, 7 p.m.

I.E.E. (N. Staffs). Annual dance at Crown Hotel, Stone, 8.30 p.m.

I.E.E. (Tees-side). Annual dinner and reunion at Zetland Hotel, Saltburn, 7.30 p.m.

N.E. ELECT. CLUB. Annual dinner at County Hotel.

INSTN. OF MECHANICAL ENGRS. Thomas Hawksley Lecture: "Properties of Matter at High Pressure." Prof D. M. Newitt. 1 Birdcage Walk, S.W.1, 5.30 p.m.

SATURDAY, 19 NOV.

INCORP. PLANT ENGRS. (London). Annual dinner and dance at Waldorf Hotel.

A.S.E.E. (Oxford and Reading). "Modern Remote Control and Indication Techniques." C. Gordon White, Y.M.C.A., 10 George St, Oxford, 6.30 p.m.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

Doulton Vitrified Pipes Ltd. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: O. Sherwood Doulton and T. A. Wright. Doulton Hse, Albert Embankment, S.E.1.

James' Electrical Wholesalers (Keighley) Ltd., 50 Sun St, Keighley. Nom. cap.: £4,000. Dirs.: C. C. James and R. S. Holmes.

Star Vac Supplies Ltd., 242 Goldhawk Rd, W.12. Manufacturers of and dealers in domestic, household and general electrical and other equipment, etc. Nom. cap.: £1,000. Dirs.: R. E. Langham and Mrs W. V. Langham.

Pinnick and Simmons Ltd., 102 White Hart Lane, N.17. Mechanical, electrical and general engineers, precision engineers, etc. Nom. cap.: £1,000. Dirs.: W. Pinnick and S. Simmons.

Cambray (Heaters) Ltd., 6 Cambray Place, Cheltenham. To acquire, foster, develop, produce and distribute the invention "Heatwave," an electrically-heated seat for cars, tractors and household uses, etc. Nom. cap.: £5,000. Dirs.: W. Dembowski and W. M. Jasilkowski.

Ilford Music Shop Ltd., 4th Ave., Pioneer Market, Ilford Lane, Ilford, Essex. Manufacturers of and dealers in electrical and mechanical apparatus and accessories, in particular wireless sets and valves, gramophones, television sets, etc. Nom. cap.: £500. Dir.: R. Paikin.

Denco Miller Ltd., Holmer Rd, Hereford. Heating, ventilating and domestic engineers, etc. Nom. cap.: £1,000. Dirs.: L. D. Colam and J. Clements.

West Instruments Ltd. Manufacturers of and dealers in precision industrial temperature control equipment, etc. Nom. cap.: £10,000. Dirs.: to be appointed by subs. Subs.: B. Sutton and D. Wisdom, 28 Lincolns Inn Fields, W.C.2.

Exelements Ltd., 56 Wellington Rd, St. Johns Wood, N.W.8. Manufacturers of and dealers in electrical elements and electrical goods, etc. Nom. cap.: £100. Dirs.: W. E. Baldwin and Violet W. Baldwin.

Frank S. Polden and Co., Ltd., 24a and 24b York Place, Leeds 1. Factors of and dealers in electrical equipment, etc. Nom. cap.: £10,000. F. S. Polden signs as director.

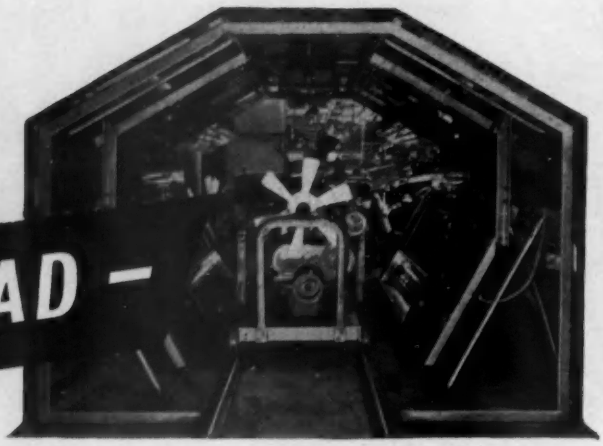
the call is for Hewittic mobile rectifiers

★ The illustrations show, above, Hewittic mobile rectifiers providing a shore to ship supply and, inset, one of a number of 250 kW units. Each equipment comprises a complete substation fitted with transformer, rectifier, voltage regulator, A.C. and D.C. switchgear, and protective gear.

Send for Publication R.224 "Hewittic Rectifiers for D.C. Supply to Dockyards"

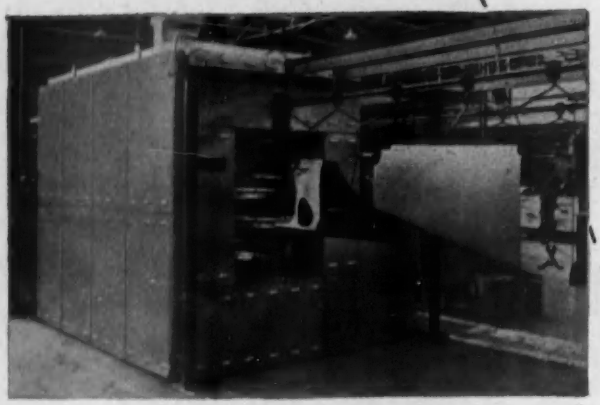
HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
WALTON-ON-THAMES - SURREY - ENGLAND
Telephone: Walton-on-Thames 760 (8 lines) Telegrams & Cables: "Electric, Walton-on-Thames"

OVERSEAS REPRESENTATIVES: ARGENTINA: H. A. Roberts & Cia., S.R.L., Buenos Aires. **AUSTRALIA:** Hackbridge and Hewittic Electric Co. Ltd., Sydney. **SOUTH AUSTRALIA:** Parsons & Robertson Ltd., Adelaide. **BELGIUM & LUXEMBOURG:** M. Dorfman, 124 Avenue des Cerisiers, Woluwé, 1, Brussels. **BRAZIL:** Oscar G. Mors, Caixa Postal 1280, Sao Paulo. **CANADA:** Northern Electric Co. Ltd., Montreal, etc. **CEYLON:** Envee Ess 'Ltd., Colombo. **CHILE:** Ingenieria Electrica S.A.C., Santiago. **EAST AFRICA:** Gerald Hoe (Lighting) Ltd., Private Bag, Nairobi. **EGYPT:** Giacomo Cohenca Fils, S.A.E., Cairo. **FINLAND:** Sähkö-ja Koneliike O.Y. Hermes, P. Esplanaadikatu 37, Helsinki. **HOLLAND:** J. Kater E.I., Ouderkerk a.d. Amstel, Amsteldijk Noord 103c. **INDIA:** Steam & Mining Equipment (India) Ltd., Calcutta; Easun Engineering Co. Ltd., Madras, 1. **IRAQ:** J. P. Bahoshy Bros., Baghdad. **MALAYA, SINGAPORE & BORNEO:** Harper Gilfillan & Co. Ltd, Kuala Lumpur. **NEW ZEALAND:** Richardson, McCabe & Co. Ltd., Wellington, etc. **PAKISTAN:** James Finlay & Co. Ltd., Karachi. **SOUTH AFRICA:** Fraser & Chalmers (S.A.) (Pty.) Ltd., Johannesburg. **RHODESIA:** Fraser & Chalmers (S.A.) (Pty.) Ltd., Salisbury etc. **THAILAND:** Vichien Phanich Co. Ltd., Bangkok. **TRINIDAD & TOBAGO:** Thomas Peake & Co., Port of Spain. **TURKEY:** Dr. H. Salim Öker, 43 ,Posta Caddesi, Ankara. **URUGUAY:** H. A. Roberts & Cia., S.A.U., Montevideo. **U.S.A.:** Electro Machinery Corporation, 50 Broad Street, New York, 4.



WELL AHEAD —

...with faster, better finishing



2

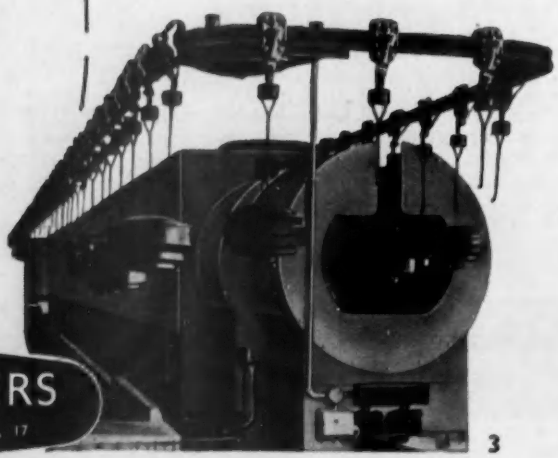
Metrovick Infra-red plant is already used by an important section of the motor industry for drying and stoving products ranging from small accessories to complete bodies. Process time is cut and the finish obtained is more durable.

Metrovick specialist engineers will be glad to help you to obtain a faster and better finish on your products.

1. These nine standard Metrovick 3 ft. 4 kW projectors are used by A.E.C. Ltd. for stoving and drying horizontal and vertical engine castings.

2. Conveyorised stoving plant, used by the London Transport Executive, is designed to stove one complete set of reconditioned items for bus body overhaul per hour, allowing for parts requiring more than one coat of paint.

3. One of three similar installations designed for stoving synthetic paints on motor car accessories. These plants in the AC-Delco factory will handle up to 60,000 accessories in a 40 hour working week.



3

METROPOLITAN-VICKERS

ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

Member of the AEI Group of Companies

Leaders in Industrial Process Heating

L/1·503

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all their classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

COUNTY BOROUGH OF BURTON UPON TRENT

STREET LIGHTING

THE Corporation invite tenders for the carrying out of the following works within the County Borough of Burton upon Trent:

Scheme (*a*)

Installation of Group "B" Street Lighting consisting of 126 150 W Tungsten lamps together with concrete columns.

Scheme (*b*)

Installation of Group "A" Street Lighting consisting of 109 Sodium discharge lamps and 14 500 W Tungsten lamps together with concrete columns.

Scheme (*c*)

Installation of Group "A" Street Lighting consisting of 123 3 x 80 W Fluorescent lamps together with concrete columns.

Specifications, Bills of Quantities, etc., may be obtained on application to the Borough Surveyor, Town Hall, Burton upon Trent, and plans showing the locations of the lamps may be inspected during normal office hours at the office of the Borough Surveyor.

Sealed tenders, in the envelopes provided, must be delivered to the undersigned not later than 10 a.m. on Friday, 25 Nov., 1955.

The acceptance of a tender or tenders will be subject to the Standing Orders of the Council with respect to Contracts and to the execution of a formal Contract.

The Council do not bind themselves to accept the lowest or any tender and reserve the right to accept separate tenders for the three schemes.

H. BAILEY CHAPMAN,
Town Clerk.

Town Hall,
Burton upon Trent.
3 Nov., 1955. (V 763)

FEDERAL HYDRO-ELECTRIC BOARD OF RHODESIA AND NYASALAND

Kariba Hydro-Electric Scheme

THE Federal Hydro-Electric Board propose to call for tenders for the 330 kV Switchgear and Associated Equipment required for the Kariba Hydro-Electric Scheme.

The work will comprise the supply, delivery and erection of the equipment at Kariba Power Station situated on the Zambesi and at five substations situated at Kitwe, Salisbury, Norton, Umniati and Bulawayo.

The equipment to be provided will comprise steel structures, busbars, power-operated isolators, circuit-breakers, protective and control gear and all ancillary equipment including multicore cabling and earthing.

The circuit-breakers at Kariba Power Station will be required to have a making and breaking capacity of 7,500 MVA whilst the circuit-breakers must be capable of dealing with a rate of rise of restriking voltage of approximately 3,000 V per microsecond and the total break time shall not exceed 3 cycles.

All equipment shall be designed for an impulse level of 1,350 kV at an altitude of 4,000 ft.

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Contractors who may be interested in tendering should submit full details of their qualifications and experience by 5 Dec., 1955, after which tender documents and drawings will be issued to those contracting organisations who satisfy the requirements of the Board.

Details of qualifications and experience should be sent in duplicate to the Secretary, Federal Hydro-Electric Board, P.O. Box 630, Salisbury, Southern Rhodesia, with a copy to the Mechanical and Electrical Consulting Engineers, Merz and McLellan, Carliol House, Newcastle upon Tyne 1, England. (V 809)

CITY OF PETERBOROUGH

THE Council invites tenders from recognised electrical contractors for the electric lighting and power installations to 42 permanent houses at Tennyson and Wilberforce Rds, Peterborough.

Drawings, specifications and forms of tender may be obtained on application to Mr L. H. Robjohn, M.B.E., A.M.I.C.E., A.M.I.MUN.E., City Engineer and Surveyor, Town Hall, Peterborough.

Applications must be received before noon on Monday, 21 Nov., 1955, and must be accompanied by a cheque for £2. 2s. made payable to the Peterborough City Council. This deposit will be returned on receipt of a bona fide tender or by the return of the documents.

C. PETER CLARKE,
Town Clerk.

Town Hall,
Peterborough.
Nov., 1955. (V 793)

BOROUGH OF ROMFORD

THE Council invites Tenders for the supply of the following vehicles:

(*a*) A 25 ft 3-stage Tower Wagon mounted on 2/3 ton vehicle chassis with Diesel Engine.

(*b*) Two 5 cwt Vans.

Particulars and Tender forms may be obtained on application to the Town Clerk, Town Hall, Romford, Essex, to whom completed forms must be returned not later than 25 Nov. (V 823)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18–64, or a woman aged 18–59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

KENT COUNTY COUNCIL

require ENGINEERING INSPECTORS with good practical experience in the design and maintenance of electrical and/or heating, hot and cold water and cooking installations in buildings. Salary within scales £675/£825 and £600/£725 according to experience. Application forms from County Architect, Springfield, Maidstone. Closing date 30 Nov., 1955. (V 807)

SOUTH EASTERN ELECTRICITY BOARD

DISTRICT ENGINEER—
CENTRAL SUSSEX DISTRICT

SALARY £900/£975 per annum under N.J.B. Class E, Grade 3. Superannuable. Applicants should be qualified Engineers with sound knowledge of all aspects of the work of a District Engineering Dept. Experience should include the planning, construction, operation and maintenance of underground and overhead systems up to 33 kV. The successful candidate will be required to reside within the district and may elect to have a service tenancy of a Board's flat. It is possible that the classification of the District will change to "F" during the coming year.

Applications, naming two referees, to Arthur Barnes, M.I.E.E., Central Sussex Manager, SEEBoard, Electra House, Church Rd, Haywards Heath, by 23 Nov., 1955.

FOURTH ASSISTANT DISTRICT ENGINEER—
CROYDON DISTRICT

Salary £635/£680 per annum plus London Weighting under N.J.B. G.11 Superannuable. Applicants should be suitably qualified and have practical experience in E.H.V. and L.V. three- and single-phase distribution.

Applications, naming two referees, on forms from H. Lowe, M.I.E.E., District Manager, SEEBoard, Electric House, Wellesley Rd, Croydon, by 23 Nov., 1955.

DISTRICT COMMERCIAL ASSISTANT—
CROYDON DISTRICT

Salary £585 x £20—£645 per annum plus London Weighting under N.J.C. Grade 3. Superannuable. Applicants should have a wide experience of consumer service, tariffs, apparatus, sales and wiring estimating.

Applications, naming two referees, on forms from H. Lowe, M.I.E.E., District Manager, SEEBoard, Electric House, Wellesley Rd, Croydon, by 23 Nov., 1955.

SENIOR SHOWROOM ASSISTANT—
CROYDON DISTRICT

Salary £525 x £20—£585 per annum plus London Weighting under N.J.C. Grade 2. Superannuable. The successful applicant will be required to take charge of the New Addington showroom, but he should be prepared to work at any showroom in Croydon district.

Applications, naming two referees, on forms from H. Lowe, M.I.E.E., District Manager, SEEBoard, Electric House, Wellesley Rd, Croydon, by 23 Nov., 1955.

ENGINEERING DRAUGHTSMAN AT
HEADQUARTERS, HOVE

Salary £510 x £20—£630 under N.J.B. Schedule D, Grade 6. Superannuable. Duties will include the layout of substations up to 33 kV. Previous drawing office experience essential. Candidates should possess adequate technical qualifications, with a knowledge of construction and manufacturing methods.

Applications, naming two referees, to W. E. Gibbs, M.I.E.E., M.AMER.I.E.E., Engineer-in-Chief, SEEBoard, 10 Queen's Gardens, Hove 3, by 23 Nov., 1955.

A. L. BURNELL,
Secretary.
(V 799)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Aberdeen Area

APPLICATIONS are invited for the post of ASSISTANT ENGINEER (TECHNICAL), Aberdeen Area. Salary commencing at a point within the range of £715/£760 (N.J.B. Grade F.8) depending upon qualifications and experience.

The successful applicant will be responsible for detailed work on systems such as V.H.F. modile radio, multi-channel V.F.T. and power line carrier, normal telephony; and also supervisory equipment.

Candidates should be technically qualified with Post Office or equivalent experience. Supply undertaking experience would be an advantage.

Application forms obtainable from the undersigned should be returned not later than 26 Nov., 1955.

J. E. WHITTAKER,
Area Manager.

Area Offices,
Millburn St,
Aberdeen. (V 806)

YORKSHIRE ELECTRICITY BOARD

No. 1 (Bradford) Sub-Area

THIRD ASSISTANT ENGINEER
(DISTRIBUTION DESIGN)

APPLICANTS should possess technical qualifications equivalent to those for Corporate membership of the Institution of Electrical Engineers and have experience in the planning and design and estimating of medium and high voltage Overhead and Underground distribution systems. They should have experience in the construction and maintenance of such systems.

Salary—N.J.B. Class K, Grade 10, £790/£20/£850 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53 Sunbridge Rd, Bradford, not later than 24 Nov., 1955.

No. 3 (Sheffield) Sub-Area

FOURTH ASSISTANT ENGINEER
(DISTRIBUTION DESIGN)

Applicants should hold at least the Higher National Certificate in Electrical Engineering and have had constructional, operational and maintenance experience on overhead and underground distribution systems.

Salary—N.J.B. Class M, Grade 13, £755/£15/£800 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 24 Nov., 1955.

No. 5 (Wakefield) Sub-Area

Barnsley District

THIRD ASSISTANT DISTRICT ENGINEER

Applicants must have had a sound practical training and considerable experience in the construction, operation and maintenance of H.V. and M.V. Overhead and Underground Distribution Network, Substation Plant and Ancillary Equipment.

Applicants should hold a current driving licence, and be prepared to reside in the District and undertake standby duties.

Preference will be given to those who are Corporate Members of the Institution of Electrical Engineers, or who hold equivalent qualifications.

Salary—N.J.B. Class F, Grade 9, £675/£15/£720 per annum.

Doncaster District

THIRD ASSISTANT DISTRICT ENGINEER

Applicants must have had a sound practical training and considerable experience in the construction, operation and maintenance of H.V. and M.V. Overhead and Underground Distribution Network, Substation Plant and Ancillary Equipment.

Candidates must be prepared to reside in the District and undertake standby duties.

Preference will be given to those who are Corporate Members of the Institution of Electrical Engineers, or who hold equivalent qualifications.

Salary—N.J.B. Class F, Grade 9, £675/£15/£720 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 24 Nov., 1955. (V 775)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

COMMERCIAL ASSISTANT required in the Caernarvon District, to be based on Bangor, in the Board's No. 4 Sub-Area. Salary within the range £675/£720 per annum (N.J.B. E/8).

Applicants should have had an engineering training, and experience in dealing with installation work, consumers' supply enquiries and general commercial duties.

The appointment is superannuable and subject to medical examination.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham. Closing date: 21 Nov., 1955. (V 770)

CENTRAL ELECTRICITY AUTHORITY

South Eastern Division

1. ASSISTANT ENGINEER (WORKS OFFICE CO-ORDINATION)—BRIGHTON "A" AND "B" POWER STATIONS

CLASS L, Grade 7, £1,035/£1,125 per annum. The purpose of the position is to co-ordinate the work of Operation, Maintenance and other technical services, and includes responsibility for staff engaged upon the planning of plant maintenance and the development of new methods of working. The post offers exceptional opportunities to someone having experience of maintenance in industry. This is a new appointment calling for organising ability and the development of fresh ideas. Education up to Higher National Certificate is desirable.

2. THIRD ASSISTANT ENGINEER (OP)—DIVISIONAL HEADQUARTERS, KINGSTON

Class AX/DX, Grade 4, £750/£875/£950 per annum plus London allowance. Successful applicant will investigate and analyse all aspects of Power Station operation in order to determine the effectiveness of plant, equipment, organisation, etc., and make recommendations for improvement. Candidates should have been educated to H.N.C. standard. Power Station experience, though desirable, is not essential. Alertness, an unbiased mind and keenness are called for together with the desire to apply these qualities over a wide field in a rapidly expanding industry.

3. MATHEMATICIAN—DIVISIONAL HEADQUARTERS, KINGSTON

required in the Generation, Economics and Methods section of the Operation Department. Class AX/DX, Grade 5 or 6 £675/£800/£860 per annum or £600/£725/£785 per annum plus London Allowance. As a minimum qualification, candidates should have a first degree in pure or applied mathematics. Successful applicant will be engaged on work associated with investigation into power plant performance. A knowledge of the techniques employed in Operational Research would be an advantage.

4. ASSISTANT ENGINEER (MAINTENANCE)—CROYDON "A" POWER STATION

Class F, Grade 11 £595/£640 per annum plus London Allowance. Applicants should have good experience of general maintenance and overhaul of H.P. turbine and boiler plant and auxiliary plant. Successful applicant will assist the Maintenance Engineer with organisation and supervision of mechanical maintenance department. This position offers opportunities of good experience in this field. Practical training with technical qualifications to H.N.C. standard is desirable.

Applications which should preferably not be made on a stereotyped application form should be submitted to the following to arrive by 19 Nov.

1. Station Superintendent, Brighton Power Station, Portslade-by-Sea, Sussex.
2 and 3. Establishments Officer, Central Electricity House, Lower Ham Road, Kingston-upon-Thames, Surrey.
4. Station Superintendent, Croydon "B" Power Station, Beddington Farm Road, Croydon, Surrey. (V 816)

DEPUTY PRINCIPAL

required by the Government Technical Institute, British Guiana, for three years in the first instance. Appointment either (*a*) with prospect of permanent and pensionable employment with salary in scale £950 rising to £1,200 a year, or (*b*) on contract terms with salary up to £1,200 a year and resettlement grant up to £270 a year. (Teachers' Superannuation rights can be preserved.) Free passages. Liberal leave on full salary. Candidates must hold a City and Guilds full Technological Certificate or a Higher National Certificate in Electrical or Mechanical engineering or a similar qualification and have had wide industrial and teaching experience. They must be able to undertake lectures at all levels up to the standard of the H.N.C. and the examinations for the Professional Institutions. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2A/30288/EE. (V 767)

THE NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:

Area Board Headquarters

FOURTH ASSISTANT ENGINEER, Chief Engineer's Department, Construction Section, Carliol House, Newcastle upon Tyne.

Applicants should hold H.N.C. in electrical engineering or equivalent qualification, and should have had practical training in and some experience of the design and erection of H.V. and L.V. Overhead Lines and the installation and jointing of H.V. and L.V. underground cables, including preliminary survey work.

Salary—Schedule C, Grade 6, £600/£785.

Tees Sub-Area

DEMONSTRATORS for location at Bishop Auckland, Redcar and Middlesbrough.

Applicants should have a certificate of a recognised Domestic Science Training College and/or E.A.W. Certificate, preferably the latter, also considerable experience as a Demonstrator or Assistant Demonstrator in the Electricity Supply Industry.

Salary—Grade 1, £425/£525 per annum. Annual increments of £20 up to £465, beyond £465, increments subject to certificate of competence.

Harrogate Sub-Area

FOURTH ASSISTANT ENGINEER, Construction Sections, Sub-Area Headquarters.

Applicants should have survey experience and preferably experience in construction and maintenance of overhead lines. Duties mainly H.V. or L.V. overhead line survey and levelling, preparation of profile drawings and construction schedules.

Salary—Schedule A, Class G, Grade 13, £555/£600.

Applicants stating age, qualifications and experience, to be received by the Secretary, Establishments, The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. (V 800)

MECHANICAL AND ELECTRICAL ENGINEERS IN VARIOUS GOVERNMENT DEPARTMENTS

THE Civil Service Commissioners invite applications for pensionable posts in a wide variety of mechanical and electrical engineering duties.

Candidates must be under 35 on 1 Jan., 1955, with extension for regular service in H.M. Forces and up to two years for permanent civil service. For the Post Office they must be at least 21, for Ministry of Supply, and Ministry of Transport and Civil Aviation (Civil Aviation Organisation) at least 23; for other posts at least 25 on that date.

Generally a candidate must possess a University degree in Engineering or be a Corporate Member of one of the professional institutions—Mechanical Engineers, Electrical Engineers, or Civil Engineers or have passes in, or exemption from, Section A or I and B or II of the corresponding Associate Membership examinations. Exceptionally, candidates of high professional attainment, but without the specified qualifications, may be admitted. For some posts Associate Fellowship of the Royal Aeronautical Society or an Honours degree in Physics or Engineering will be accepted.

London salary (Men) £705 (at age 25) to £1,095. Starting salary according to age up to £970 at 34. Candidates entering below age 25 will start at salaries varying from £493 at age 21 to £625 at age 24. Prospects of promotion. Salaries of next higher grades are £1,095/£1,415 and £1,470/£1,595. Somewhat lower in the provinces. Women's scales lower but being improved under equal pay scheme.

Further particulars and application forms from Civil Service Commission, Scientific Branch, 30 Old Burlington St, London, W.1, quoting No. S85/55. Completed applications should be returned as soon as possible and in any case before 31 Dec., 1955. (V 777)

CENTRAL ELECTRICITY AUTHORITY
Southern Division

APPLICATIONS are invited for the following posts:

SHIFT CHARGE ENGINEER
PORTSMOUTH GENERATING STATION
S/13.758

Applicants should have had previous experience in a large modern generating station, and preferably have had manufacturing works experience. They should preferably possess technical qualifications admitting to corporate membership of a recognised professional engineering institution.

Salary N.J.B. Grade G.7, £790/£850.

MECHANICAL MAINTENANCE ENGINEER
OXFORD GENERATING STATION
S/13.755

Applicants should have experience of the maintenance of generating station plant and be capable of taking control of maintenance staff and supervising boiler and turbine overhauls. Applicants should possess H.N.C. or equivalent, and preference will be given to candidates possessing or studying for qualifications admitting to corporate membership of a recognised professional institution.

Salary N.J.B. Grade D6, £715/£760.

ASSISTANT CHEMIST, DIVISIONAL LABORATORY, DIVISIONAL HEADQUARTERS, PORTSMOUTH
S/13.756

Applicants should preferably have had some practical experience in the analysis of either coal, oil or water, and general analytical work. Experience will be gained in work associated with atmospheric and river pollution and investigation of plant problems, while the prospects for promotion are good. Candidates should have reached at least intermediate B.SC. standard or its equivalent, and successful candidates will be given every encouragement to qualify. There are good conditions of service, including a superannuation scheme, 5-day week, canteen facilities, and sports and social activities.

Salary N.J.B. Grade AX/CX6: Within range £600/£765.

GENERAL ASSISTANT ENGINEERS
S/13.757

Applicants should have served an apprenticeship or had practical training suitable to the industry. They should possess a sound general and technical education and preference will be given to those possessing a Higher National Certificate (or those nearing completion of H.N.C. courses). Opportunities are available for general assistant engineers to complete their studies and gain wide experience with good prospects of promotion.

The duties of those appointed will vary, but will include, as a general rule, the operation and control, under supervision, of generating plant.

Vacancies also exist for those who wish to specialise in maintenance of electrical and mechanical generating plant, transmission lines, substations and cables, or generating station construction work.

Salary N.J.B. within scales £475/£640.

Special application forms for each post obtainable from P. D. A. Oliver, Divisional Secretary, 111 High St, Portsmouth, should be returned by 23 Nov., 1955. Please quote reference "E.T." (V 796)

MID-ESSEX TECHNICAL COLLEGE AND SCHOOL OF ART
Market Road, Chelmsford

REQUIRED as soon as possible:

LECTURER IN TELECOMMUNICATIONS to take charge of Radio H.N.C. Courses and C. and G. Telecommunications courses. Graduate qualifications.

ASSISTANT GRADE B to assist with Radio H.N.C., O.N.C. and C. and G. Telecommunication courses. Graduates or equivalent qualifications desirable.

ASSISTANT GRADE A for O.N.C. S.1 and S.2. Engineering Science, Drawing, Mathematics. Graduate or equivalent qualifications not essential.

Salaries according to the Burnham Further Education Report, 1954. Details and forms (stamped addressed foolscap envelope) from the Clerk to the Governors at the College. (V 818)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT ENGINEER required in the Clwyd District of the Board's No. 4 Sub-Area. Salary within the range £790/£850 per annum (N.J.B. E/5).

Applicants should have experience in the construction and operation of E.H.T., H.T., and L.T. overhead and underground distribution systems, including indoor and outdoor substation equipment, and should have the appropriate technical qualifications.

The appointment is superannuable and subject to medical examination.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham. Closing date: 21 Nov., 1955. (V 769)

CENTRAL ELECTRICITY AUTHORITY
Midlands Division

ATTRACTIVE openings as GENERAL ASSISTANT ENGINEERS are available in the Midlands to men interested in making an Engineering Career in the Central Electricity Authority's Power Stations. It is necessary that applicants should have received a sound technical training, and should preferably have had some industrial engineering experience.

The appointments are permanent and superannuable with excellent opportunities for advancement; salary within the range £475/£680 per annum. Apply on form AE6, quoting vacancy number 124MD to the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13. (V 772)

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

THE Trinidad and Tobago Electricity Commission require:

CHARGE ENGINEERS for their Generating Stations at Port of Spain and at Penal. Applicants should have experience in the operation of modern Steam Turbines, Water Tube Boilers and Diesel Generators, and must have Graduate Membership of the I.E.E., or I.Mech.E., or Associate Membership I.Mar.E., or the Higher National Certificate in Mechanical Engineering, or 2nd Engineer's M.o.T. Diesel and Steam Certificates or R.N. equivalent. The installed capacity is at present as follows:

Port of Spain: 12·5 MW of Steam Turbines and Boiler plant of 450 lb p.s.i. and 700° F, and 7·5 MW of large Diesel Generators and a 10 MW Turbo-Alternator is in process of erection.

Penal: 10 MW of Steam Turbines and Boiler plant of 450 lb p.s.i. and 700° F, and a 20 MW Turbo-Alternator is in process of erection.

The annual salary for the above posts is £1,045 rising to £1,127. 10s. by annual increments of £27. 10s. When plant now in the process of erection is commissioned the salary will rise by the same increments to £1,237. 10s.

For all these posts a partly-furnished house will be provided at a rent of 10% of salary to a maximum of £10. 8s. 4d. per month plus a small extra charge for heavy furniture. The successful candidates will be required to pass a medical examination and will be provided with first-class passages for himself, his wife and two children up to the age of eighteen. A temporary cost of living allowance of £25 per annum is also paid. An outfit allowance of £60 is paid on arrival. Leave passages to the United Kingdom will be provided every three years. Vacation, and Sick Leave is given on full pay. There is a superannuation scheme similar to the C.E.A. and Area Boards' Scheme. General information on Trinidad, Climate, Income Tax, etc., can be obtained from the West India Committee, 40 Norfolk St, London, W.C.2.

Applications giving full details of qualifications, age, experience, etc., together with two recent testimonials should be sent by airmail to reach the General Manager, Trinidad and Tobago Electricity Commission, Port of Spain, Trinidad, by 15 Dec., 1955. (V 764)

GOVERNMENT OF THE BAHAMAS

VACANCIES exist in the Electrical Department, Bahamas for (*a*) DEPUTY DIRECTOR (BCD 145/27/01) and (*b*) DISTRIBUTION ENGINEER (BCD 145/27/02).

Duties of (*a*) are to assist in the administration of the Electricity Supply Undertaking and System Development; (*b*) to take charge of all transmission and distribution, H.V. and L.V. overhead and underground system and substations to 33 kV.

Both appointments are on contract, for 3 years. (*a*) at a salary of £1,200 per annum with the probability of revision to £1,600 per annum.

(*b*) at a salary of £1,000 in the scale £1,000 x £25—£1,100 per annum with the probability of revision to £1,400 per annum. A gratuity at the rate of £150 per annum is payable on satisfactory completion of contracts. Government quarters are provided at a rental not exceeding £120 per annum. Free passages are provided for the officer, his wife and up to two children under 18 years of age. Leave is granted at the rate of 4 weeks for each year of resident service. There is at present no direct taxation in the Bahamas.

Candidates for (*a*) must be A.M.I.E.E. with experience in both Technical and Administrative Branches of Electricity Supply. Experience in both diesel and steam generating plant an advantage.

Candidates for (*b*) must have passed, or have been exempted by, the Institution of Electrical Engineers from Sections A and B of their examination for A.M.I.E.E. Experience with an Electrical Supply Undertaking is essential.

Apply in writing to the Director of Recruitment, Colonial Office, Great Smith St, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference number shown against the post applied for. (V 756)

CENTRAL ELECTRICITY AUTHORITY
North Western, Merseyside and N. Wales Division

VACANCY No. E.279/408/T. SECOND ASSISTANT STATION CHEMIST, Hartshead Generating Station, Stalybridge. Salary £635/£680 (G.11).

Vacancy No. E.279/407/T. SECOND ASSISTANT STATION CHEMIST, Barton Generating Station, Urmston, Manchester. Salary £675/£720 (H.11).

Vacancy No. E.279/406/T. FIRST OR SECOND ASSISTANT STATION CHEMIST, Stuart St Generating Station, Bradford, Manchester. Salary £755/£800 (H.9) or £675/£720 (H.11), according to qualifications and experience.

H.N.C. in Chemistry or equivalent qualification essential for all posts, together with experience in the analysis of coal, water and oil.

Applications, quoting Vacancy No. and giving full details, should be sent to Divisional Secretary, Central Electricity House, 825 Wilmslow Rd, Manchester 20, before 19 Nov. (V 788)

CENTRAL ELECTRICTY AUTHORITY

require a FOURTH ASSISTANT ENGINEER (Scientist) Male or Female in the Chief Engineer's Department, Bankside House, London, S.E.1. Candidates should be qualified Chemists, with a University Degree or C.M.I.CHEM.E. or the Royal Institute of Chemistry. Experience of power station practice will be an advantage but is not essential. The successful candidate will be required to act as junior assistant to the Scientific Adviser on problems concerned with combustion in boilers and atmospheric pollution. The duties will not include Laboratory work but will be mainly analytical and reporting of information and, after suitable training, microscopy. Salary within N.J.B. Grade 4, £709/£893 per annum, inclusive, according to qualifications and experience. Applications stating age, present position, salary and giving full details of training, qualifications and experience should be forwarded to D. Moffat, Director of Establishments, Winsley St, W.1, by 26 Nov., 1955. Quote Ref. AE/692. (V 768)

CENTRAL ELECTRICITY AUTHORITY
Eastern Division

APPLICATIONS are invited for the following appointments in the Thames North Control Centre at Redbourn, near St. Albans, Herts:

SECOND ASSISTANT ENGINEER (TELECOMMUNICATIONS)

Salary Class AX/DX, Grade 2, £950 x £25—£1,075/£1,165 per annum.

Applicants should possess an honours degree or should possess professional qualifications equivalent to the requirements for Associate Membership of the Institution of Electrical Engineers and should have had considerable experience in the design, installation, and maintenance of all types of telecommunication equipment used by the Authority. Experience in the maintenance of the telecommunication equipment at a Grid Area Control Centre is desirable.

FOURTH ASSISTANT ENGINEERS (TELECOMMUNICATIONS)

Salary Class AX/DX, Grade 5, £675 x £25—£800/£860 per annum.

Applicants should possess professional qualifications equivalent to the Higher National Certificate in Electrical Engineering. Experience in the maintenance of all types of telecommunication equipment associated with a Grid Area Control Centre is desirable.

The successful applicants for the above positions will be required to reside within a reasonable distance of Redbourn.

Applications stating age, qualifications and experience should be sent to the Controller, Central Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, by 26 Nov., 1955.

W. N. C. CLINCH,
Controller.
(V 776)

CENTRAL ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

STATION CHEMIST, STAYTHORPE POWER STATION, NEAR NEWARK, NOTTS
Vacancy No. 194/55/ET

Candidates should be Associates of the Royal Institute of Chemistry or hold an equivalent qualification and must have had previous experience in a position of responsibility in a Power Station laboratory.

Candidates should be familiar with the analysis of coal, oil and water and with the interpretation and application of the analytical results. Experience with the problems arising from high pressure, high temperature operation and with their solution is desirable.

Salary will be in accordance with Class J, Grade 7 (£900 x £25—£975 per annum) of the National Joint Board Agreement. The Station classification is due to be changed to Class K in the near future.

Arrangements can be made to provide a rented house if desired.

Closing date for receipt of applications, 18 Nov., 1955.

BOILER HOUSE SUPERINTENDENT DERBY POWER STATION
Vacancy No. 193/55/ET

Applicants must have had a thorough mechanical training and wide experience in the efficient operation and maintenance of Boiler House Equipment in large Generating Stations. They must be familiar with the organisation and compilation of technical records and statistical data, and a knowledge of the chemistry of combustion is necessary. Experience of Pulverised Fuel Firing will be an advantage.

Preference will be given to candidates who are Corporate Members of the Institution of Mechanical Engineers or who hold appropriate equivalent qualifications.

Salary will be in accordance with Class F, Grade 6 (£790 x £20—£850 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 18 Nov., 1955.

FIRST ASSISTANT CHEMIST CASTLE DONINGTON POWER STATION
Vacancy No. 199/55/ET

Previous experience in a Power Station laboratory is essential and candidates should preferably be Associates of the Royal Insti-

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tute of Chemistry or hold an equivalent qualification. Candidates must be familiar with the methods of sampling and analysis of coal, oil and water and with the interpretation and application of the analytical results. Experience with problems arising from high pressure, high temperature operation and of the solution of such problems is desirable.

Salary will be in accordance with Class L, Grade 9 (£900/£975 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25 Nov., 1955.

SECOND ASSISTANT CHEMIST NORTH WILFORD POWER STATION, NOTTINGHAM
Vacancy No. 195/55/ET

Candidates must have had a sound technical training and some previous Laboratory experience and should hold the Ordinary National Certificate.

Salary will be in accordance with Class K, Grade 11 (£755/£800 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25 Nov., 1955.

THIRD ASSISTANT ENGINEER (ELECTRICAL) GENERATION (CONSTRUCTION) CASTLE DONINGTON POWER STATION
Vacancy No. 200/55/ET

Applicants should have had a fundamental training in electrical engineering, including workshops, and should preferably have had experience in the manufacture, erection and maintenance and operation of electrical plant as installed in modern Power Stations. Preference will be given to candidates who possess a Degree or the equivalent, or are Graduate Members of the Institution of Electrical Engineers.

Salary will be within Schedule C, Class AX/DX, Grade 4 (£750/£950 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25 Nov., 1955.

ASSISTANT SHIFT CHARGE ENGINEER SPONDON POWER STATION
Vacancy No. 191/55/ET

Applicants should possess the Higher National Certificate or its equivalent and have had experience in a responsible position in a modern Generating Station.

The salary will be in accordance with Class H, Grade 9 (£755 x £15—£800 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 18 Nov., 1955.

GENERAL ASSISTANT ENGINEER (CHEMIST) CASTLE DONINGTON POWER STATION
Vacancy No. 198/55/ET

Candidates must have had a sound technical training and some previous laboratory experience and should hold the Ordinary National Certificate in Chemistry.

Salary will be in accordance with Class L, Grade 18 (£515/£560 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25 Nov., 1955.

SHIFT CONTROL ENGINEER SPONDON POWER STATION
Vacancy No. 201/55/ET

Applicants should have had a sound training and practical experience in a modern Generating Station. The possession of a Higher National Certificate in Electrical Engineering or its equivalent, would be advantageous.

Salary will be in accordance with Class H, Grade 10 (£715/£760 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25 Nov., 1955.

These appointments will be pensionable within the terms and provisions of the Central Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.
4 Nov., 1955. (V 798)

CENTRAL ELECTRICITY AUTHORITY
London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or C. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. for posts (*a*) and Corporate Membership for posts (*b*) an advantage.

(*a*) ASSISTANT ENGINEER (EFFICIENCY AND TESTING) ACTON LANE GENERATING STATION
Vacancy No. 55/881

Experience on plant testing and heat balance calculations desirable. Salary—Class H, Grade 10=£750. 15s. per annum.

(*a*) STATION SHIFT CONTROL ENGINEER BARKING "C" GENERATING STATION
Vacancy No. 55/882

Sound engineering training necessary with some experience in control and operation of steam generating plant and main switchgear in modern power station. Salary—Class J, Grade 10=£792. 15s. per annum.

(*a*) ASSISTANT ENGINEER (EFFICIENCY) BATTERSEA GENERATING STATION
Vacancy No. 55/883

Engineer appointed will carry out investigations on all matters concerning Thermal Efficiency and carry out necessary tests on Boilers, Turbines, etc. He will also generally supervise preparation of station statistics. Salary—Class L, Grade 12=£792. 15s. per annum.

(*a*) ASSISTANT SHIFT CHARGE ENGINEER GROVE ROAD GENERATING STATION
Vacancy No. 55/884

Sound engineering and technical training necessary with practical experience in Generating Station operation. Salary—Class F, Grade 9=£708. 15s. per annum. (Applicants to Vacancy 55/777 will be considered and need not re-apply.)

(*a*) SHIFT CHARGE ENGINEER WANDSWORTH GENERATING STATION
Vacancy No. 55/885

Sound technical training necessary with practical experience of operational control of Boilers, Turbines and E.H.T. Switchgear. Salary—Class D, Grade 7=£708. 15s. per annum.

(*a*) ASSISTANT MAINTENANCE ENGINEER (ELECTRICAL) WOOLWICH GENERATING STATION
Vacancy No. 55/886

Extensive experience in maintenance of modern E.H.T. and L.T. Switchgear, motors, alternators and all electrical and auxiliary plant appertaining to a Generating Station. Salary—Class G, Grade 9=£750. 15s. per annum.

(*b*) SECOND ASSISTANT ENGINEER (PROGRESS) CONSTRUCTION DEPARTMENT, DIVISIONAL H.Q.
Vacancy No. 55/887

The Engineer appointed will be responsible for co-ordination of progress work, the following up of orders for materials and also deliveries and liaison with the co-ordination section at Headquarters. He will also be required to attend progress meetings. A sound knowledge of engineering and Power Stations is necessary. Salary—Class AX/EX, Grade 2=£997. 10s./£1,245 per annum.

(*b*) SECOND ASSISTANT ENGINEER GROUP IV HEADQUARTERS
Vacancy No. 55/888

Applicants should be familiar with operational requirements of modern Generating Stations. Knowledge of salary and wage agreements for Electricity Industry an additional qualification. Appointment offers opportunity for experience in executive and administrative functions, and duties will include analysis of returns and programmes, and investigation of engineering problems. Successful candidate will be required to assist the Group Generation Engineer (O) in matters relating to control of a large group of Stations. Salary—Class AX/EX, Grade 2=£997. 10s./£1,125/£1,245 per annum.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, Central Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland St, W.1, and be received within 14 days of this advertisement. (V 790)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

PRINCIPAL ASSISTANT (STORES) required in the No. 2 Sub-Area Accounts Department, Eversley, Frodsham, near Warrington.

Salary within the range £795/£870 per annum (N.J.C. Grade 6).

Applicants must be competent in the supervision of staff and organisation of work and should have a thorough knowledge and practical experience of the operational control of stores and stores records.

The appointment is superannuable and subject to medical examination.

Applications, giving full details of previous experience and qualifications, should be forwarded to the Manager, No. 2 Sub-Area, Sandiway House, near Northwich Cheshire. Closing date: 21 Nov., 1955. (V 771)

SOUTHERN ELECTRICITY BOARD

ASSISTANT ENGINEER (PLANNING)

OXFORD District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class H, Grade 11 (£675/£720 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks, and to undertake standby duties if required. Suitable technical qualifications and field planning experience are necessary.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, and returned to him in envelopes suitably endorsed, not later than 25 Nov., 1955.

ASSISTANT ENGINEERS PLANNING) (TWO VACANCIES)

Aldershot District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class F, Grade 10 (£635/£680 per annum). N.J.B. Conditions of Service.

The successful candidates will be required to assist the Planning Engineer in the preparation of schemes and estimates for extensions and/or reinforcements to overhead and underground H.V. and L.V. networks. Applicants should have had experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground systems, substation plant and distribution equipment. The possession of suitable technical qualifications will be an advantage and the appointment will involve standby duties.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed, not later than 25 Nov., 1955.

ASSISTANT ENGINEER (MAINTENANCE AND OPERATION)

Isle of Wight District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class E, Grade 10 (£595/£640 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist with the operation and maintenance of H.V. and L.V. distribution mains and substations, and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed, not later than 25 Nov., 1955.

ASSISTANT ENGINEER (PLANNING)

Isle of Wight District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class E, Grade 10 (£595/£640 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks, and will be required to undertake standby duties if necessary. The possession of suitable technical qualifications will be an advantage.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed, not

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later than 25 Nov., 1955.

WAYLEAVE OFFICER

Aldershot District of No. 3 (Portsmouth) Sub-Area. Salary N.J.C. Grade 2 (£525/£585 per annum). N.J.C. Conditions of Service.

Candidates must possess ability to negotiate Wayleave Agreements for the erection or laying of electric lines and installation of Substation Plant.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed, not later than 25 Nov., 1955.

CARTOGRAPHIC AND RECORDING DRAUGHTSMAN (MALE)

Basingstoke District of No. 3 (Portsmouth) Sub-Area for duty in District Engineer's Office. Salary within the range £170/£495 per annum, dependent upon age, qualifications and experience. N.J.C. Conditions of Service.

Applicants should possess a General Certificate of Education, or its equivalent, and preference will be given to those already in possession of an elementary knowledge of Electrical Engineering, or undertaking training for their Ordinary National Certificate.

Applications on forms obtainable from the District Manager, Southern Electricity Board, Manor House, Winchester Rd, Basingstoke, and returned to him in envelopes suitably endorsed, not later than 25 Nov., 1955.

The successful candidates for the above appointments will be required to contribute to the C.E.A. and Area Boards' Superannuation Scheme, if eligible. (V 797)

MANCHESTER EDUCATION COMMITTEE

Openshaw Technical College

Principal:

J. R. Fullard, M.ENG., A.M.I.MECH.E.

APPLICATIONS are invited from suitably qualified persons for the post of full-time TEACHER OF ELECTRICAL INSTALLATION work to the level of City and Guilds Certificate "B" examinations.

Candidates should hold a Higher National Certificate in Electrical Engineering or Final City and Guilds certificate in Electrical Installation and have good industrial experience.

The salary for the post will be in accordance with the scale for Assistants, Grade A of the Burnham Further Education Report 1954 (£450 x £18—£725).

The commencing point on the scale may include up to a maximum of twelve increments at £18 for appropriate industrial experience over the age of 21 years, plus increments for war service.

Application forms and conditions of appointment may be obtained (stamped, addressed foolscap envelope) from the Chief Education Officer, Education Offices P.O. Box 480, Deansgate, Manchester 3, to whom completed application should be returned by 28 Nov., 1955. (V 787)

BOROUGH OF ILFORD

ASSISTANT ELECTRICAL ENGINEER A.P.T. II

Borough Engineer's Department

CANDIDATES should preferably hold the Ordinary National or Higher National Certificate for Electrical Engineering and have served an apprenticeship in this field and must have experience in the preparation of estimates, specifications, designs, drawings, supervision of work on site and testing in schools, public buildings and housing. Salary in accordance with Grade A.P.T. II of the National Scales of Salaries viz. £560 x £20—£640 per annum, plus London Weighting, commencing salary being fixed having regard to qualifications and experience.

The Council is prepared, if necessary, to consider the provision of housing accommodation in connection with this appointment.

Appointment permanent, superannuable and subject to medical examination. Application forms obtainable from the Town Clerk, Town Hall, Ilford, Essex, must be returned by Monday, 5 Dec., 1955. (V 822)

GOVERNMENT OF NORTHERN RHODESIA

ELECTRICAL ENGINEER, Public Works Department, Building Branch, Northern Rhodesia.

Duties are to assist the Senior Electrical Engineer with the preparation of designs, specifications and contract documents and supervision of the work.

Appointment is on contract for one tour of 3 years in the range £1,128/£1,860 per annum, point of entry according to war service and experience. A gratuity of £25—£37. 10s. is payable for each completed 3 months of satisfactory service. Free passages are provided for the officer, his wife and up to one full fare for children. Government quarters will be provided at a reasonable rent. Leave at the rate of five days for each month of residential service.

Candidates should be between the ages of 32 to 44 and should either have a University Degree or Diploma in electrical engineering carrying exemption from Sections A and B of the examinations of the Institution of Electrical Engineers or have passed those examinations.

Candidates should have experience in the design and construction of electrical installations and equipment supplied from mains or small generating sets for large buildings such as hospitals, schools, camps and allied steam and water installations.

Apply in writing to the Director of Recruitment, Colonial Office, Great Smith St, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference number BCD/112/3/015. (V 755)

LONDON ELECTRICITY BOARD

SENIOR AND ENGINEERING DRAUGHTSMEN

APPLICATIONS are invited for the following posts:

SENIOR DRAUGHTSMAN
WESTERN SUB-AREA
Ref.: PER/V/2063/T

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: building and civil engineering design, engineering drawing, plant layout in substations. In addition the applicant should be capable of supervising Engineering Draughtsmen and/or Junior Draughtsmen, if required.

The post is graded under Schedule D of the National Joint Board Agreement as Grade 5—£672/£777 per annum, inclusive of London Allowance.

ENGINEERING DRAUGHTSMAN
WESTERN SUB-AREA
Ref.: PER/V/2064/T

Candidates should have had a good general and technical education and be experienced in drawing office routine, electrical diagrams, mains survey and recording of mains work, and layout of plant in transformer chambers.

ENGINEERING DRAUGHTSMEN
CHIEF ENGINEER'S DEPARTMENT
(DRAWING OFFICE)
Ref.: PER/V/1989/T

Applicants should preferably have served an engineering apprenticeship and have had technical training to Ordinary National Certificate level, together with experience in the layout of transforming plant, H.V. switchgear and cables.

ENGINEERING DRAUGHTSMEN
SOUTHERN SUB-AREA
Ref.: PER/V/2068/T

Candidates should have a good general and technical education up to Ordinary National Certificate standard, be neat and capable draughtsmen and experienced in one or more of the following subjects: drawing office routine, electrical diagrams, lay-out of plant in transformer chambers, mains survey and recording of mains work.

The posts of Engineering Draughtsmen are graded under Schedule D of the National Joint Board Agreement, as Grade 6—£535. 10s. to £661. 10s. per annum, inclusive of London Allowance.

Application forms obtainable from Personnel Officer, 46/7 New Broad St, London, E.C.2, to be returned completed by 19 Nov., 1955. Please enclose addressed envelope and quote appropriate reference number of vacancy preferred, as indicated above. (V 674)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

PRINCIPAL ASSISTANT in the Wayleave Department at the Board's Head Office in Edinburgh. The post is superannuable and will entail travelling throughout the Board's Area.

Candidates should have good experience in agricultural and timber valuations and preferably should hold a professional qualification such as Corporate Membership of the Royal Institute of Chartered Surveyors. Salary £870 x £30—£960 (N.J.C. Grade 7) with placing according to qualifications and experience.

Application Form may be obtained from The Secretary, 16 Rothesay Terr, Edinburgh 3, and should be returned within 14 days from the publication of this notice. (V 804)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

Shropshire and Hertfordshire Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER (WELLINGTON DISTRICT)

Duties involve the construction, maintenance and operation of E.H.V. and L.V. Mains and Substations and the planning of system reinforcements and mains extensions. Applicants should have had experience in the Electricity Supply Industry. Technical qualifications desirable. Salary £675/£720 per annum (N.J.B. Grade F.9).

THIRD ASSISTANT ENGINEER (ROSS-ON-WYE)

Applicants should be able to advise consumers with regard to all the commercial activities of the Board, including the preparation of estimates for wiring installations of all types, and the supervision generally of contracting and sales work. Some experience in the operation of distribution systems up to and including 11 kV would be an advantage. Salary £635/£680 per annum (N.J.B. Grade E.9).

Apply within fourteen days, stating age, experience, present salary and position, to Mr W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

Central Gloucestershire Sub-Area

DISTRICT ENGINEER (STROUD)

Applicants should have had a sound technical training and extensive experience in the operation and maintenance of high and low voltage distribution networks and associated switchgear, transformers, and protective systems. Technical qualifications desirable. Salary £900/£975 per annum (N.J.B. Grade E.3).

SALES REPRESENTATIVE (MALE) (DURSLEY)

Duties include advice to consumers on matters concerning supply, tariffs, apparatus sales, wiring and installation thereof. The successful applicant will be required to complete satisfactorily a two months' residential training course. An adequate allowance will be paid during this period and thereafter the salary will be within the range of £425/£525 per annum (N.J.C. Grade 1).

Apply within fourteen days, stating age, experience, education, present salary and position to Mr S. Raybould, Sub-Area Manager, Midlands Electricity Board, 126 London Rd, Gloucester.

Wolverhampton and District Sub-Area

THIRD ASSISTANT ENGINEER (ARCHITECTURAL)

Applicants should have reached the final R.I.B.A. standard or hold equivalent qualifications and should preferably have a knowledge of quantities. The duties will include preparation of drawings, construction and detail, of offices, service centres, stores and general building work. Salary £790/£850 per annum (N.J.B. Grade K.10).

Apply within fourteen days, stating age, experience, present salary and position, to Mr D. Holt, Sub-Area Manager, Midlands Electricity Board, 83 Darlington St, Wolverhampton.

Birmingham and District Sub-Area

SECOND ASSISTANT ENGINEER (TRANSMISSION SECTION)

Wide experience required in the installation, operation and maintenance of Switchgear, Transformers, Cables and Protective Equipment on circuits up to and including

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33 kV, and of an extensive tele-communication system. Applicants must have technical qualifications commensurate with eligibility for Associate Membership of the Institution of Electrical Engineers. Salary £1,110/£1,200 per annum (N.J.B. Grade M.7).

Apply within fourteen days, stating age, experience, present salary and position, to Emil Braathen, Sub-Area Manager, Midlands Electricity Board, 14 Dale End, Birmingham 4.

Board Headquarters

THIRD ASSISTANT ENGINEER (COMMERCIAL)

Duties include undertaking the preparation of Estimates and Tenders for large scale Industrial, Commercial and other wiring installations and to co-ordinate similar work in the Districts and Sub-Areas of the Board. Applicants should have had a wide practical experience in all wiring installation work, and be familiar with the latest practices and techniques. Some knowledge of Industrial production practice and electric hot water storage systems would be an advantage. Salary £875/£1,120 per annum (N.J.B. Schedule C, Grade 3).

PRINCIPAL ASSISTANT (FEMALE) (COMMERCIAL)

Duties include assisting in the instruction of Trainee Service Centre and Sales Assistants and Demonstrators, to advise on the woman's point of view on electricity in the home, and to organise and supervise Sales and Demonstration staffs at major Shows and Exhibitions. The successful candidate will also be expected to co-ordinate the activities of demonstration staffs and to maintain a uniformly high standard of Housecraft Demonstrations and promote modern sales methods and techniques. Applicants will be required to show evidence of wide experience in practical demonstration and sales work and of training demonstration and sales staff. A practical knowledge of the Electricity Supply Industry is desirable, and experience with Manufacturers will be an advantage. Salary £870/£960 per annum (N.J.C. Grade 7).

Apply within fourteen days, stating age, education, qualifications, present position and salary to The Secretary (Ref.: FWC), Midlands Electricity Board, Mucklow Hill, Halesowen, Nr. Birmingham.

A. STEPHENS,
Secretary.
(V 795)

KENT COUNTY COUNCIL

require ELECTRICAL ENGINEERS with experience in the electrical equipment of buildings. Salaries within scales £650/£775, £560/£640 and £500/£580. Preference to Graduate Members of the Institution of Electrical Engineers. Application forms from County Architect, Springfield, Maidstone. Closing date: 21 Nov., 1955.
(V 761)

HER MAJESTY'S OVERSEA CIVIL SERVICE

APPLICATIONS are invited for the following post:

POWER STATION SUPERINTENDENT, ADEN

Duties are to take charge of the operation and maintenance of a 20,000 kW oil-burning steam station. Appointment is either to pensionable establishment or on contract at a salary according to experience—maximum £1,788. A gratuity of £37. 10s. for each completed period of 3 months' service is payable on satisfactory completion of contract.

Free first-class passages are provided for the officer, his wife and up to 4 children under 18 years of age. Government quarters are provided at a rental of 10% basic salary. Generous leave and limited free medical attention.

Candidates should preferably be A.M.I. MECH.E., and must be experienced in operation of Steam Station of comparable capacity, with a sound knowledge of generation at 6·6 and 11 kV.

Further details on application in writing to the Director of Recruitment, Colonial Office, Sanctuary Buildings, Great Smith St, London, S.W.1, quoting reference number BCD 145/2/01. (V 754)

SOUTH OF SCOTLAND ELECTRICITY BOARD

STATION SHIFT CONTROL ENGINEER, YOKER POWER STATION

APPLICATIONS are invited for the position of Shift Control Engineer at Yoker Power Station. The post is superannuable and the salary in accordance with Class F, Grade 10, of the N.J.B. Agreement, namely, £635 x £15—£680.

Applications should be made on the standard application form obtainable from 351 Sauchichall St, Glasgow, C.2, and to be returned not later than 18 Nov., 1955.

J. MEEK,
Secretary.
(V 808)

CENTRAL ELECTRICITY AUTHORITY
Midlands Division

ASSISTANT ENGINEER is required at Nechells "B" Power Station, Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade J.12, £675/£720 per annum.

Applicants should have received a sound technical training and should preferably have had experience in the control of the works supply system. Appropriate technical qualifications will be an advantage.

Apply, quoting Vacancy No. 129 MD on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 21 Nov., 1955. (V 802)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

THIRD ASSISTANT ENGINEERS

(i) Hemel Hempstead District, Chilterns Sub-Area. 183/55.R.

(ii) Stevenage District, Northmet Sub-Area (2 vacancies). 184/55.R.

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary—N.J.B. Grade 9 as follows:

(i) Class E (£635/£680).

(ii) Class F (£675/£720).

Apply, by letter within 14 days, to the District Manager, Eastern Electricity Board, at the following addresses:

(i) 44 Marlowes, Hemel Hempstead, Herts.

(ii) 38 High St, Stevenage, Herts.

Hertford District, Northmet Sub-Area

(*a*) FOURTH ASSISTANT ENGINEER 185/55.R.

(*b*) GENERAL ASSISTANT ENGINEER 186/55.R.

Candidates for (*a*) should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary—N.J.B. Class F, Grade 11 (£595/£640).

Candidates for (*b*) should have had a good general and technical education and should possess the Higher National Certificate in Electrical Engineering or equivalent qualification.

Salary—N.J.B. Class F, Grade 12 (£555/£600).

Apply, by lettter, for both appointments within 14 days to the District Manager, Eastern Electricity Board, Bridgefoot, Ware, Herts. (V 801)

CENTRAL ELECTRICITY AUTHORITY
South Western Division

STATION CHEMIST required at Castle Meads Power Station.

Superannuation Scheme. Salary, N.J.B. Class E, Grade 7, £715/£760.

Candidates should possess H.N.C. in Chemistry or equivalent, and have experience in the analysis of fuels, oil and water. They should also be familiar with modern methods of water treatment and boiler water control.

Applications on Form A.E.6/ACT, obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 26 Nov., 1955. (V 773)

THE EAST MIDLANDS ELECTRICITY BOARD

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER—DERBY DISTRICT

APPLICATIONS are invited for the appointment of Second Assistant District Commercial Engineer in the Derby District of the Derby and Burton Sub-Area.

The salary and conditions for the post will be in accordance with the National Joint Board Agreement, Class G, Grade 7, at present £790 x £20 to £850 per annum.

Applicants should have a sound technical and workshop training and preferably hold the Higher National Certificate in Electrical Engineering.

They must have experience in the preparation of specifications and estimates for all classes of electrical contracting, the organisation, control, supervision and testing of installation work and the maintenance of agricultural, commercial, domestic and small industrial apparatus and equipment.

The successful candidate will be required to live in or near Derby and ability to drive a motor vehicle is essential.

Applications, giving details of age, qualifications, experience, previous and present appointments, should be forwarded to the Manager, Derby and Burton Sub-Area, 36 Full St, Derby, within 14 days of this advertisement. (V 821)

ELECTRICAL SUPERINTENDENT

required by the Gambia Government for one tour of 18 to 24 months. Appointment will be either (*a*) with prospect of permanent and pensionable employment with salary scale (including expatriation pay) £750 rising to £1,170 a year, or (*b*) on contract with salary scale £798 rising to £1,242 a year and a gratuity of £100/£150 a year. Outfit allowance £60. Free passages for officer and wife and assistance towards cost of children's passages or grant up to £132 annually for their maintenance in U.K. Candidates must have had experience with a Power Supply Company or a firm manufacturing cable or of overhead line work. They must be capable of cable laying, jointing (and testing) up to 11 kV, the erection and maintenance of both low and high tension (11 kV) overhead lines and the general maintenance of a distribution system. Preference will be given to candidates holding an O.N.C. in Electrical Engineering. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/40720/EE. (V 805)

THE NORTH WESTERN ELECTRICITY BOARD

FOURTH ASSISTANT ENGINEER (TESTING) SUB-AREA TESTING STATION, WALKDEN

APPLICANTS should have had a wide experience of testing work in a Class A Testing Station and particularly of laboratory and site testing of protective gear and applied high voltage tests. Preference given to applicants who hold the H.N.C. in Electrical Engineering.

Salary Scale: £715 x £15—£760 per annum. Grade L.13, N.J.B. Conditions.

GENERAL ASSISTANT ENGINEER, SUB-AREA TESTING STATION, WALKDEN

The successful applicant will be required to assist in the general work of the Testing Department, including the testing of Polyphase Metering Equipment, Current Transformers, Voltage Transformers and Protective Gear Testing. Applicants should hold the H.N.C. in Electrical Engineering, but consideration will be given to those holding the O.N.C. and who are progressing towards the H.N.C.

Salary Scale: £475 x £15—£520 per annum. Grade L.19, N.J.B. Conditions.

Applications for the above posts to Sub-Area Manager, No. 2 Sub-Area, The North Western Electricity Board, 2 St. George's Rd, Bolton, by 19 Nov., 1955.

(*a*) INSTALLATION INSPECTOR, BLACKPOOL
(*b*) METER REPAIRER, BLACKPOOL
(*c*) METER TESTERS, BLACKPOOL AND PRESTON

Applicants for (*a*) should have served an apprenticeship as an electrician and have a knowledge of Statutory Regulations and the I.E.E. Wiring Regulations, and be able to write clear and concise reports. Possession of the O.N.C. in Electrical Engineering, or

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its equivalent, will be an advantage.

Rates of Pay: (*a*) 52d. per hour; (*b*) 49d. per hour; (*c*) 49d. per hour, N.J.I.C. Conditions.

Applications to Sub-Area Manager, No. 4 Sub-Area, The North Western Electricity Board, 40/41 Lune St, Preston, by 19 Nov., 1955.

FOURTH ASSISTANT ENGINEER (TESTING) TROUTBECK BRIDGE TESTING STATION

Duties will be to assist with work in connection with protective gear testing and maintenance, high voltage pressure testing, and cable fault location. Some knowledge of polyphase meter testing work would be an advantage. Preference given to applicants who hold H.N.C. in Electrical Engineering.

Salary Scale: £635 x £15—£680 per annum. Grade J.13, N.J.B. Conditions.

Applications to Sub-Area Manager, No. 6 Sub-Area, The North Western Electricity Board, Castle Green, Kendal, by 19 Nov., 1955. (V 786)

CENTRAL ELECTRICITY AUTHORITY
South Eastern Division

APPLICATIONS are invited for the following FOURTH ASSISTANT ENGINEERS, Class AX/DX, £600/£725/£785 per annum plus London Allowance for Croydon and Kingston positions. Applicants should preferably possess H.N.C. or equivalent qualification.

Transmission Department based at Croydon "B" Power Station. Duties will include the issuing of permit-to-work cards and the supervision of maintenance and construction work on grid equipment.

Technical Department based at Brighton "B" Power Station. Preference will be given to those having a knowledge of automatic protective gear.

Operation Department, based at Kingston. Successful applicant will investigate and analyse all aspects of Power Station operation in order to determine the effectiveness of plant, equipment, organisation, etc., and make recommendations for improvement. Power Station experience though desirable is not essential.

Detailed written applications for all positions should be sent to the Establishments Officer, Central Electricity House, Lower Ham Rd, Kingston-upon-Thames, Surrey, to arrive by 19 Nov. (V 817)

CENTRAL ELECTRICITY AUTHORITY
North West, Merseyside & N. Wales Division

VACANCY No. E.277/409/T. ASSISTANT SHIFT CHARGE ENGINEER, Agecroft "B" Generating Station, Pendlebury, near Manchester. Salary £715/£760 (G.9).

Vacancy No. E.277/410/T. STATION SHIFT CONTROL ENGINEER, Rawtenstall Generating Station, Hareholme, Rawtenstall. Salary £515/£560 (C.10).

Vacancy No. E.277/411/T. STATION SHIFT CONTROL ENGINEER, Ince Generating Station, Elton, near Chester. Salary £715/£750 (H.10).

Vacancy No. E.277/412/T. STATION SHIFT CONTROL ENGINEER, Chadderton "B" Generating Station, near Manchester. Salary £675/£720 (G.10).

Vacancy No. E.277/418/T. SHIFT CHARGE ENGINEER, Westwood Generating Station, Wigan. Salary £790/£850 (G.7).

Vacancy No. E.277/419/T. ASSISTANT SHIFT CHARGE ENGINEER, Ince Generating Station, near Chester. Salary £755/£800 (H.9).

Vacancy No. E.277/420/T. ASSISTANT SHIFT CHARGE ENGINEER, Huncoat Generating Station, Accrington. Salary £675/£720 (F.9).

Vacancy No. E.277/421/T. STATION SHIFT CONTROL ENGINEER, Agecroft "A" Generating Station, Pendlebury, Manchester. Salary £635/£680 (F.10).

Vacancy No. E.277/422/T. STATION SHIFT CONTROL ENGINEER, Bold Generating Station, St. Helens. Salary £675/£720 (G.10).

Applications to Divisional Secretary, Central Electricity House, 825 Wilmslow Rd, Manchester 20, before 19 Nov. Quote Vacancy No. (V 789)

CENTRAL ELECTRICITY AUTHORITY
South Western Division

TECHNICAL STAFF VACANCIES, GENERATION CONSTRUCTION DEPARTMENT BRISTOL

(*a*) SECOND ASSISTANT ENGINEER (Mech.) N. J. B. Class AX/CX, Grade 2, £950/£1,135.

(*b*) FOURTH ASSISTANT ENGINEER (Mech.) N.J.B. Class AX/CX, Grade 2, £950/£1,135.

(*c*) FOURTH ASSISTANT ENGINEER (Co-ord.) N.J.B. Class AX/CX, Grade 6, £600/£765.

(*d*) FOURTH ASSISTANT ENGINEER (Elec.) N.J.B. Class AX/CX, Grade 6, £600/£765.

(*e*) SENIOR ENGINEERING DRAUGHTSMAN (Mech.) N.J.B. Schedule D, Grade 5, £640/£740.

Superannuation Scheme.

Applicants for: (*a*) should have had sound mechanical engineering training and preferably possess A.M.I.MECH.E., or equivalent qualification. Experience in the design, layout and specification of mechanical plant including pumping, heating and pipework systems associated with modern p.f. and oil-fired Power Stations an advantage.

For (*b*) should have had Drawing Office and Works training with experience in Power Station equipment, preferably including design work and knowledge of plant specifications.

For (*c*) should have had a sound engineering training, a knowledge of modern Power Station layout, and some construction site experience. Duties mainly concerned with programming and co-ordination of Power Station construction work.

For (*d*) should have had appropriate technical and works training, be familiar with modern practice concerning transformers, motors, switch and control gear. Experience in design, specification and layout of power station electrical equipment considered an advantage.

For (*e*) should have had a sound technical training and preferably be experienced in design and layout of Power Station equipment, turbines, boilers, pipework, etc.

Applications on Form A.E.6/ACT, obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 26 Nov., 1955. (V 774)

AN ELECTRICAL ENGINEER is required to assist in the planning of an electro-chemical project. Previous experience in heavy industry or large scale production of power is essential. A knowledge of electric smelting or allied process would be advantageous.

The successful candidate would be required to undergo a training period of 2-3 months in the works of an overseas subsidiary company in Europe and would then be based on the Head Office of the Company in London. A limited amount of travelling in the U.K. and overseas would be involved.

This is a senior appointment with good prospects of future promotion. The salary will be commensurate with previous experience and qualifications. Assistance with house purchase will be given.

Reply stating full details, including present salary to—Box No. 4993, Electrical Times. (V 813)

ASSISTANT ELECTRICAL ENGINEERS required by Brandt and O'Dell for their Branch Office in Middlesex for work in connection with power and lighting distribution in buildings, overhead lines and private generating stations. Excellent remuneration offered for suitable men. Apply in first instance, in writing, to Grosvenor Gardens House, Victoria, S.W.1, giving full particulars of career and experience. (V 778)

ASSISTANT ENGINEER required for Overhead Line Contracts, Inverness Area. Good Salary plus subsistence if applicable. Apply: B. French Ltd., Pike Mills, Green St, Kidderminster. (V 751)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

GEORGE WIMPEY AND CO., LTD.
(Mechanical Engineering Division)
invite enquiries from
SENIOR DESIGN ELECTRICAL DRAUGHTSMEN
and
ELECTRICAL DRAUGHTSMEN
(H.N.C. or Equivalent Standard)
for work on heavy industrial and chemical installations. Salaries according to age and experience. 5-day week. Pension Fund. Apply, with full details, to George Wimpey and Co., Ltd., 27 Hammersmith Grove, London, W.6, quoting ref. RT/2E. (V 675p)

A SHIFT ELECTRICAL CHARGEHAND ENGINEER required for large firm of wire manufacturers in the Manchester area. Qualifications required: Ordinary National Certificate in Electrical Engineering, previous experience in steel works or similar industry, conversant with high-powered electrical equipment, etc. The successful candidate would be expected to serve a probationary period of 3 months. Staff contributory pension scheme.—Box No. 4989, Electrical Times. (V 794)

ASSISTANT MECHANICAL CONTRACTS ENGINEERS required by Consultants in their London Office. Applicants must have had a good mechanical training and experience, preferably with large steam power plants and associated equipment. Duties will consist of the preparation of specifications, estimates and contract documents, and also to assist in the execution of large engineering contracts from the design stage through to the completion of the work at site. Electrical experience will be an advantage. The salary offered will be according to experience and ability, and the post is pensionable.

Applicants must state fully their technical qualifications and full particulars of training and experience to the Personnel Officer, Ewbank and Partners Ltd., 10/11 Grosvenor Place, London, S.W.1, 200 yards Hyde Park Corner, Sloane 0486. (V 748)

BRITISH THOMSON-HOUSTON COMPANY LIMITED has vacancies for YOUNG ENGINEERS OR PHYSICISTS to work on constructional problems in the development of large, high power, electronic valves. The work embraces a wide range of scientific knowledge and calls for creative ability. There are openings for graduates and for those with a Higher National Certificate or equivalent qualification. Applicants are invited to write to the Director of Research, The British Thomson-Houston Co., Ltd., Rugby, stating their age, qualifications and experience, quoting reference VC. (V 783)

DRAUGHTSMEN, SENIOR AND JUNIOR required by firm in West London, accustomed to the preparation of lighting and power schemes for all types of premises. Pension Scheme and social facilities. Apply stating age, experience and salary required to—Box No. 4983, Electrical Times. (V 757)

CONTRACT ENGINEER

fully experienced in the making out of specifications and documents for invitations to tender in the field of steam power stations and power station equipment is required for Brussels engineering department of very important Belgian electricity holding company.

Control of French language necessary.

Attractive salary and pension scheme.

Applications stating age, family, qualifications, experience, to

ELECTROBEL,
1 Place du Trône,
Brussels (Belgium).
(V 608p)

BRITISH THOMSON-HOUSTON COMPANY LIMITED has vacancies in its Research Laboratory in Rugby for ENGINEERS who are interested in light current, or radio engineering. The work involves the testing of high power microwave valves and the design, construction and maintenance of electrical pulse test equipment, including modulators, C.R.O. and automatic control circuits. The work in any one of these fields is varied and interesting and is carried out in co-operation with the team engaged in research on microwave valves. Applicants are invited to write to the Director of Research, The British Thomson-Houston Co., Ltd., Rugby, quoting reference GP, and giving age, qualification and experience. (V 782)

BRUSH Electrical Engineering Co., Ltd., require a TECHNICAL COST ENGINEER for the Rotating Electrical Machines Division. Applicants should have experience of cost analysis and estimating, preferably on rotating electrical machines, and should be capable of production design liaison between the design and process departments. Excellent prospects coupled with a good salary, non-contributory superannuation scheme, in a factory situated in a pleasant country area. Please reply to the Chief Personnel Officer, Brush Electrical Engineering Co., Ltd., Loughborough, Leics. (V 765)

CHARGEHAND ELECTRICIAN, experienced in large industrial and commercial installations required for London contracts —Box No. 4995, Electrical Times. (V 814)

DRAUGHTSMEN, Mechanical, Layout and Piping, Electrical and Tracers.

For Engineering Consultants. Positions are permanent, pensionable, with five-day week. Free lunches. Basic Salary above A.E.S.D. minimum rates, plus profit sharing scheme.

Phone or write, giving details of previous experience, to the Personnel Officer, Ewbank and Partners Ltd., 10/11 Grosvenor Place, London, S.W.1. 200 yards Hyde Park Corner. Sloane 0486. (V 736)

DRAUGHTSMEN, Johnson and Phillips Ltd. have vacancies in their Contract Department for Draughtsmen having experience in Power Station installation work, light construction, cable racking and overhead line work. Applications stating age, training and experience to Manager, Employment Department, Victoria Works, Charlton, London, S.E.7. (V 618)

ELECTRICAL ENGINEERS required to carry out research on plant used in the Iron and Steel Industry. Two graduates are required, one for work on motor drives and one on automatic control and servomechanisms, and a vacancy also exists for a research assistant with a N.C. or H.N.C. qualification. These are permanent appointments, the work is constructive and important and there are good prospects for the right men. Salaries up to £1,000 and £800 respectively for the graduates, and up to £550 for the research assistant. Interested men should apply in writing to the Personnel Officer, the British Iron and Steel Research Association, 11 Park Lane, London, W.1, quoting ref. "E.E.3." (V 758)

ELECTRICAL MOTOR DESIGNER required by centrifugal pump manufacturers. Must be experienced in the design and development of medium-sized A.C. and D.C. machines, submersible-type motors, etc. Excellent opportunity for qualified, enthusiastic and practical man to improve established and internationally-known machines, and to introduce new ideas. The post is one of responsibility and salary will be in accordance. Please send full details, including age, qualifications and experience, to the General Manager, James Beresford and Son Ltd., Stork Works, Kitts Green, Birmingham 33. Applicants may be assured that their replies will be treated as fully confidential. (V 704)

EXPERIENCED OVERHEAD LINESMAN required for South Wales area. London rates of pay and allowances. Write giving brief details of experience to—Box No. 4997, Electrical Times. ((V 815)

THE ENGLISH ELECTRIC CO., LTD.,

Liverpool Works,

have vacancies in their Transformer Department for SENIOR DRAUGHTSMEN to work on Medium and Large Power Transformers.

Previous experience in this field is not essential and men with a good knowledge of the design and detail of welded fabrications, or any kind of medium mechanical equipment, are invited to apply.

Pensionable and progressive positions are offered to men with initiative, and housing assistance will be given to selected applicants.

Write giving full details of age, qualifications, experience and when available for interview for which travelling expenses will be paid, to:

The Employment Officer,
The English Electric Co., Ltd.,
East Lancashire Rd, Liverpool 10,
quoting Ref. No. 161K.
(V 762p)

ENGINEER for Technical Engineering Department. Duties include the preparation of schemes for new thermal and nuclear energy power plants, both industrial and central, and also the technical analysis of existing plants. Candidates will be expected to provide evidence that their technical and practical background is such as will enable them to assess correctly a client's plant requirements and also to determine the suitability of plant offered by a manufacturer. The work involves a considerable knowledge of thermodynamics, fluid flow mechanics, physics and the application of these to power plant problems, for these reasons the possession of a good academic qualification in engineering is desirable. The successful candidate will be centred in London, but will be expected to undertake short visits to plant sites as required.

Applications, giving details of training, qualifications and experience to date, for the above position, should be sent to the Personnel Officer, Ewbank and Partners Ltd., Engineering Consultants, 10/11 Grosvenor Place, London, S.W.1. (V 747)

FLUORESCENT CONTROL GEAR. An opportunity exists within a large electrical engineering organisation for a man experienced in the design and production of fluorescent and discharge lamp control gear. Duties would include the design of high quality control gear and the organisation and control of a production unit for quantity production. Good starting salary and prospects. Please send full details to—Box No. 4977, Electrical Times. (V 735)

BACKER ELECTRIC CO., LTD.,
Rotherham, Yorkshire,
Manufacturers of Tubular Sheathed Heating Elements for Domestic and Industrial Applications

require

(1) SENIOR RESEARCH ENGINEER with scientific (physics, chemistry and applied electricity) qualifications and sound experience.

Duties to include: Charge of laboratory, improvement of products, research in new fields of application.

(2) SALES ENGINEER, not over 40, experienced, willing to travel.

Applications, which will be treated in confidence, to the Secretary. (V 791p)

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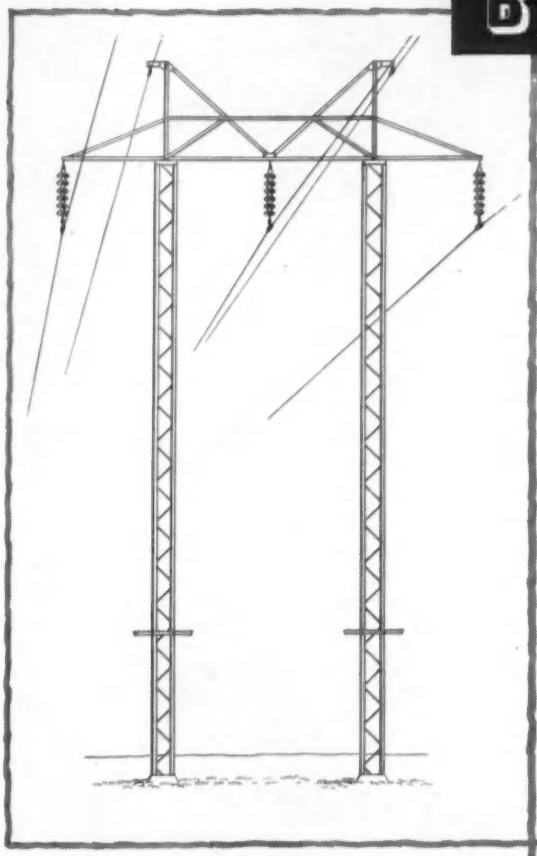

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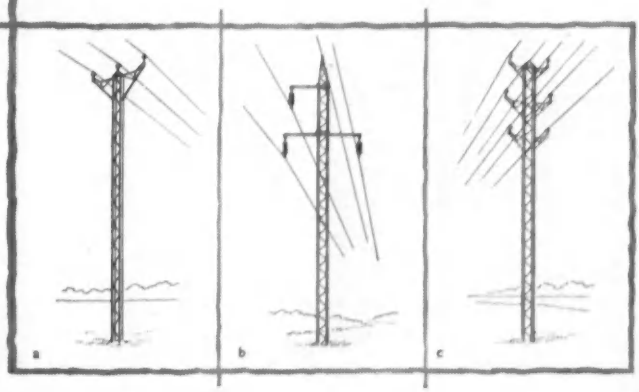

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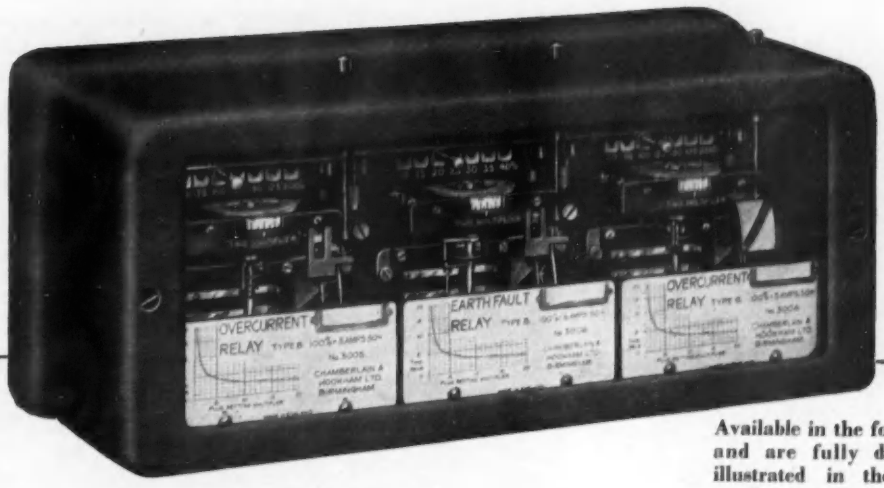

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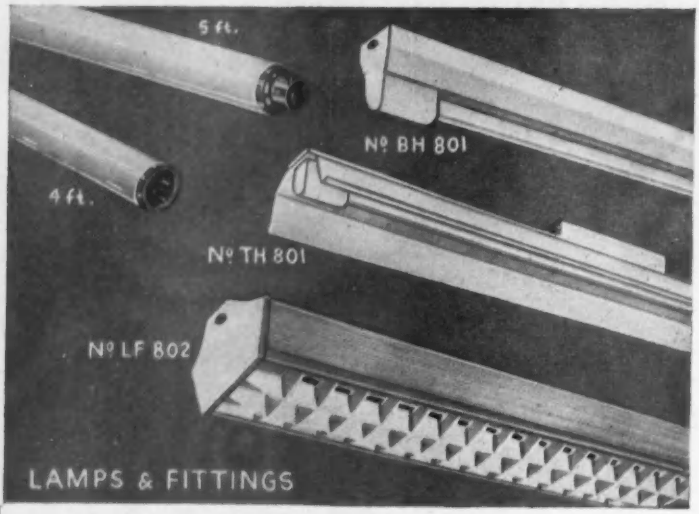

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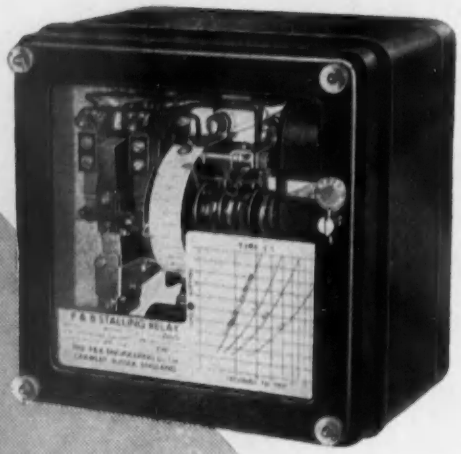

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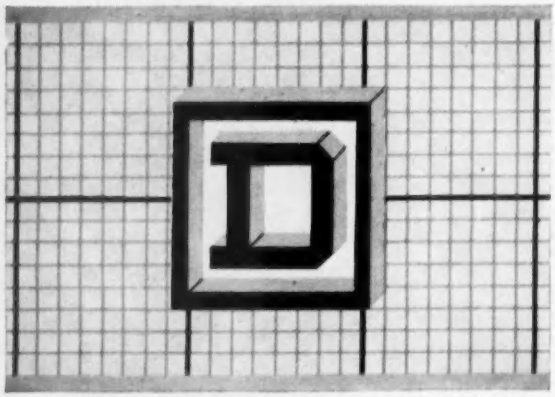

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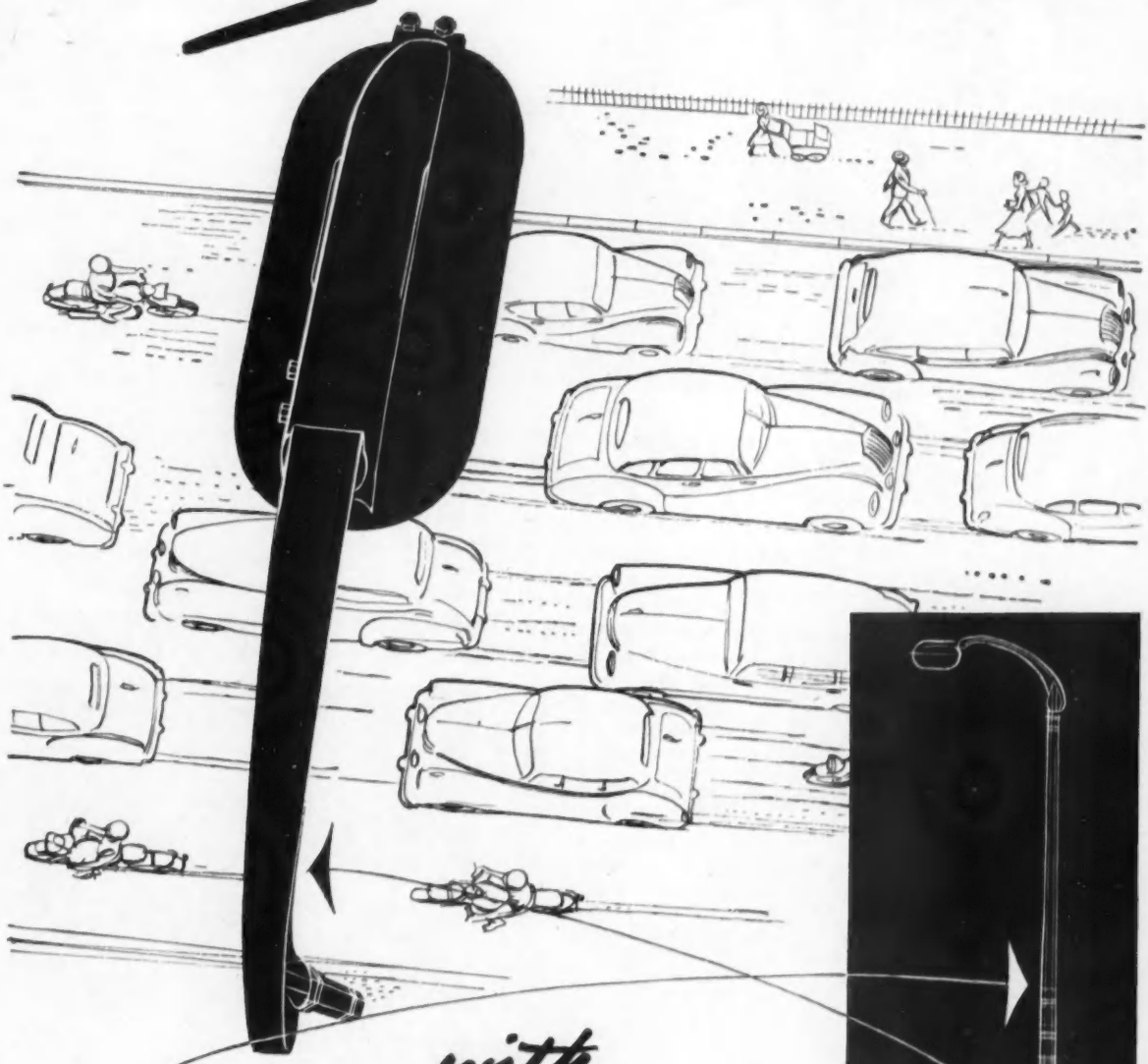

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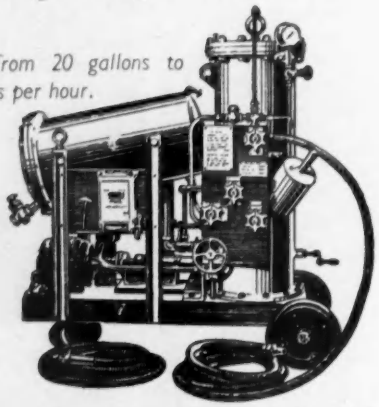

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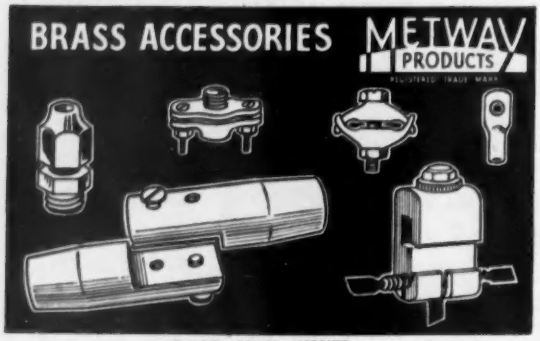

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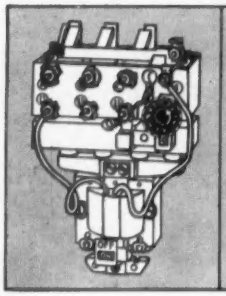	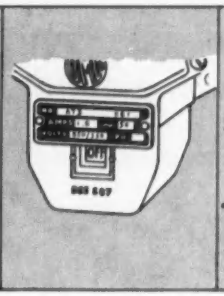	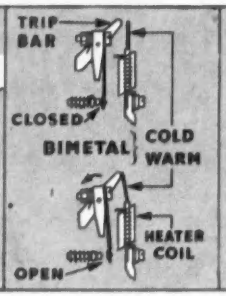	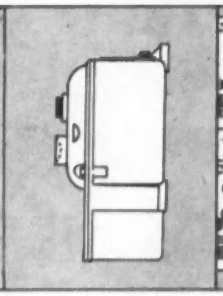	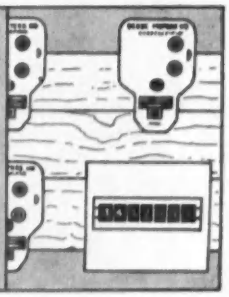
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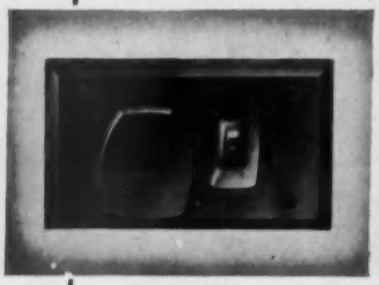

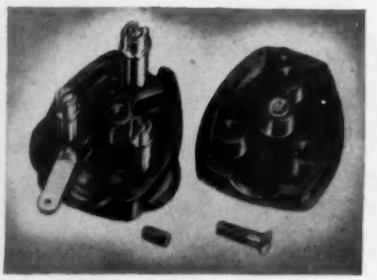

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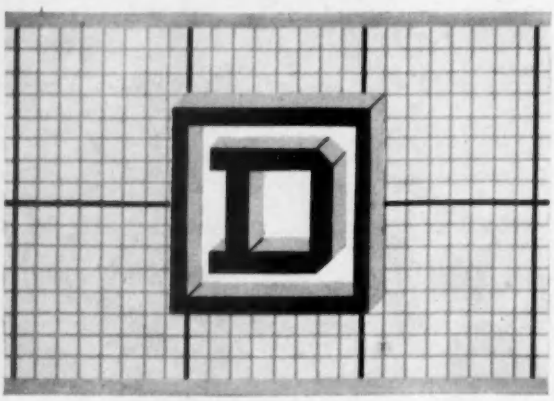

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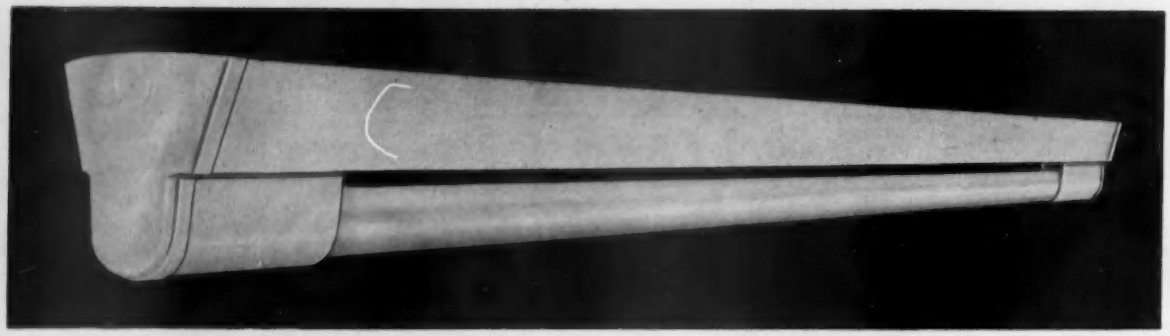

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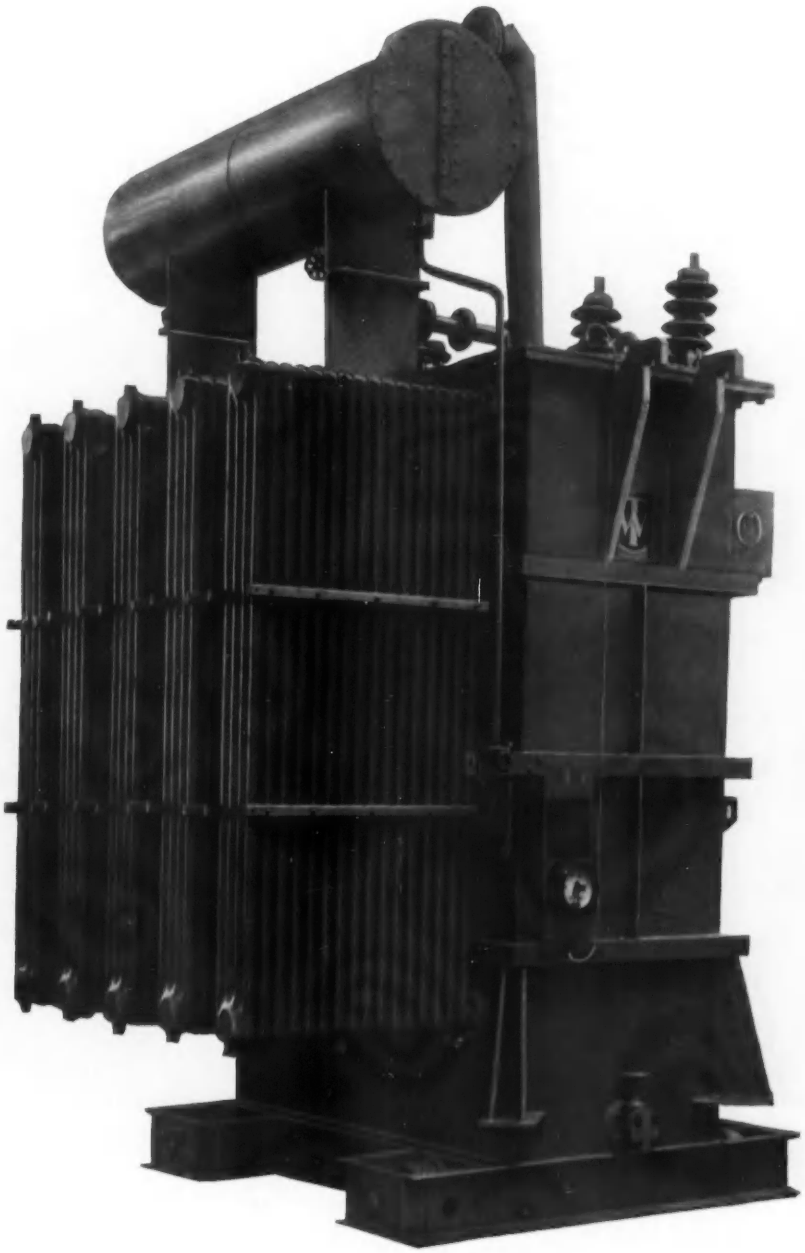

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